PLANT LIFE

9825

VOLUMES 16-20
1960-1964, incl.

EDITED BY

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THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

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PLANT LIFE, vol. 16 (1960), including the 27th issue of HERBERTIA, copyright published April 22, 1960. (184 pages, including 35 text figures.)

PLANT LIFE, vol. 17 (1961), including the 28th issue of HERBERTIA, copyright published March 27, 1961. (179 pages, including 31 text figures.)

PLANT LIFE, vol. 18 (1962), including the 29th issue of HERBERTIA, copyright published April 19, 1962. (General text 166 pages, including 25 text figures, and 11 plates; Supplement "THE PHYLA OF ORGANISMS", 44 pages, including 2 text figures.)

PLANT LIFE, vol. 19 (1963), including the 30th issue of HERBERTIA, copyright published April 24, 1963. (160 pages, including 30 text figures.)

PLANT LIFE, vol. 20 (1964), including the 31st issue of HERBERTIA, copyright published July 15, 1964. (134 pages, including 28 text figures; Supplement, "Catalog of Hybrid Amaryllis Cultivars, 1799—1963", 42 pages.

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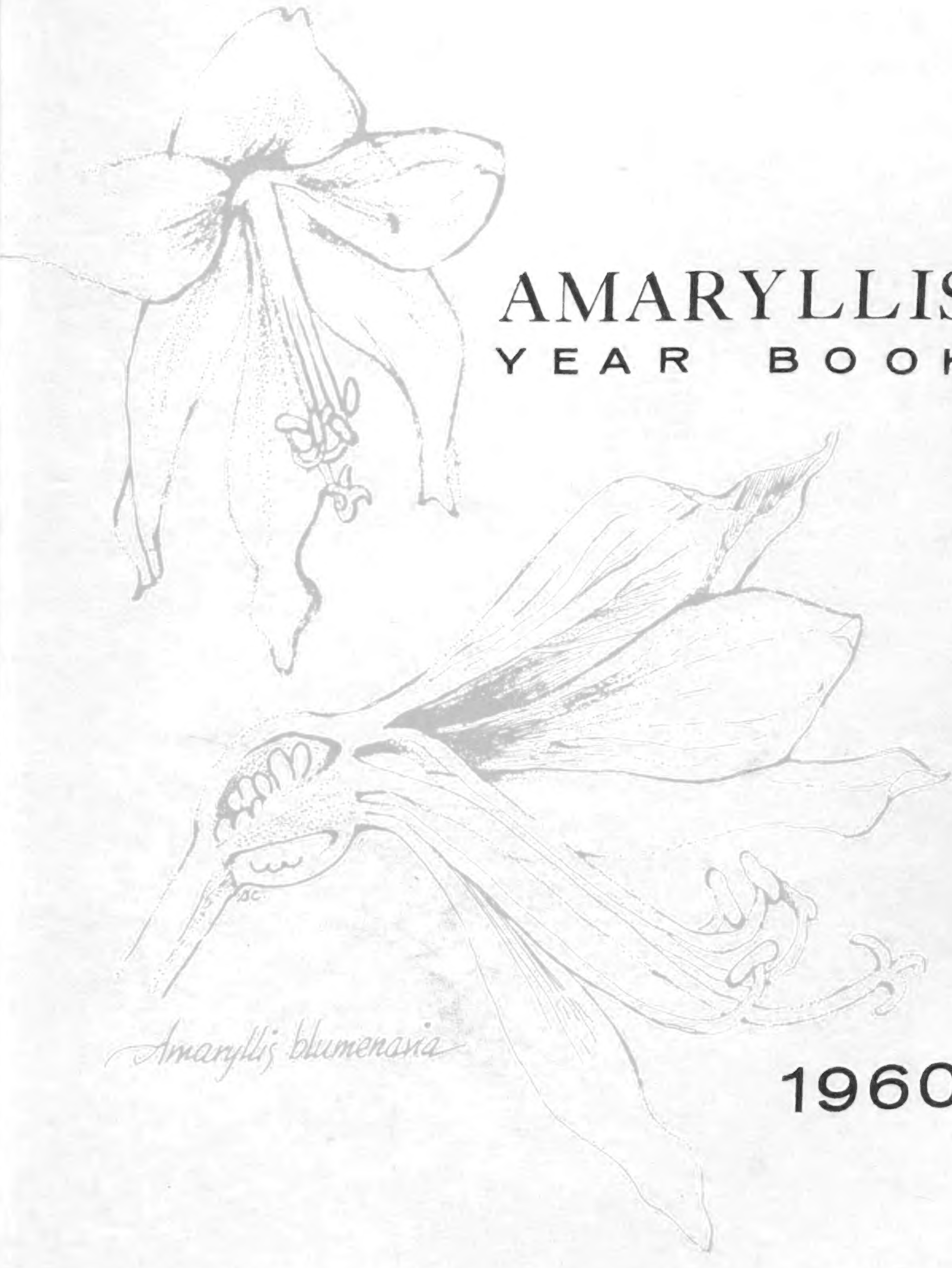
PLANT LIFE, VOL. 16, NO. 1, JANUARY, 1960

AMARYLLIS YEAR BOOK



1960

THE AMERICAN PLANT LIFE SOCIETY

THE AMERICAN PLANT LIFE SOCIETY is organized for the "increase and diffusion of knowledge concerning plant life," and to carry out its objectives the main emphasis is placed on the publication of PLANT LIFE, the periodical devoted to plant life, incl., HERBERTIA, the yearbook devoted exclusively to the amaryllids, sponsored by the affiliated AMERICAN AMARYLLIS SOCIETY. The publications are international in scope. All paid up members are privileged to receive the current issues of PLANT LIFE, incl., HERBERTIA.

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PLANT LIFE, VOL. 16, NO. 1, JANUARY, 1960

AMARYLLIS
YEAR BOOK
1960

Year Book of
The American Amaryllis Society
27th issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 181.]

PREFACE

Again, Mr. Douglas D. Craft, of the DEPARTMENT OF DESIGN, ART INSTITUTE of Chicago, has furnished an interesting cover design based on *Amaryllis blumenavia* which flowered for him in 1959. He supplements his design with an article on the same plant, and adds two full page illustrations. We are all greatly indebted to Mr. Craft for his fine contributions.

The 27th issue of the AMARYLLIS YEAR BOOK (HERBERTIA) is dedicated to Prof. Ira S. Nelson, of SOUTHWESTERN LOUISIANA INSTITUTE, who received the 1960 HERBERT MEDAL AWARD for his outstanding contributions toward the advancement of the amaryllids by bringing in alive many *Amaryllis* species and other amaryllids obtained during two plant exploration expeditions in 1954 and 1958; and for his breeding experiments with the material collected. Prof. Nelson presents an interesting autobiography and also articles giving details about his plant explorations in South America, and his breeding experiments with *Amaryllis*. The congratulations of the members go to Prof. Nelson on his accomplishments.

The articles on *Amaryllis*, again, are of special interest. Those by Prof. Nelson and Mr. Craft have just been noted. Mr. Fred B. Jones writes about three *Amaryllis* from Saba Island, and *Amaryllis belladonna* L., in South Texas. Dr. Cardenas describes two new *Amaryllis* from Bolivia, one a pure white, fragrant species, and gives a report on successful hunt for a green-flowering *Amaryllis* species in the Andes. Mr. Boshoff-Mostert reports on the famous Buller hybrid *Amaryllis* strain that he has inherited. Mrs. Pickard writes about her *Amaryllis* breeding experiences giving results. Dr. Joseph C. Smith notes the growing popularity of species *Amaryllis*, and writes about moving day for amaryllis. Mr. Goedert gives instructions for sprouting *Amaryllis* seeds, and writes about *Amaryllis* for beginners. Mr. Perrin discusses *Amaryllis* as a hobby, and Mr. Beckwith D. Smith reports on greenhouse culture of *Amaryllis*. Prof. Claude W. Davis discusses the importation of *Amaryllis* bulbs.

The other amaryllis are also adequately covered. There is a catalog of *Nerine* cultivars; and also a catalog of *Brunsvigia* cultivars that is urgently needed. Dr. Bose contributes two articles on the chromosomes of *Lycoris;* and Prof Flagg presents an article on the chromosomes of *Zephyranthes clintiae*. Dr. Howard writes about Alliums and highly-colored Crinums. Prof. Claude W. Davis describes his experiences in growing amaryllids under artificial light. Mr. Gilmer discusses five distinctive *Hemerocallis* clones. Mr. Beckwith D. Smith writes about *Sprekelia* culture, and Mr. Morris on *Eurycles*. Mrs. Flick contributes extracts from the Round Robin letters, and Mr. Woelfle writes of his gardening activities in Cincinnati. There are other important articles, and also the reports on local Amaryllis shows.

Last, but not least, Mr. Percy-Lancaster contributes a most charming Southern Rhodesia News-Letter, and Mr. Forbert gives instructions

for photography in your garden. Altogether a wonderful harvest of knowledge.

Contributors to the 1961 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1960, in order to insure earlier publication of that edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past several years. Your valued cooperation toward earlier publication will be greatly appreciated.

January 15, 1960,
5804 Camino de la Costa,
La Jolla, California.

Hamilton P. Traub
Harold N. Moldenke

CORRIGENDA

HERBERTIA VOL. 11. 1944 (1946), The Genus Allium in the U. S. S. R., A. I. Vvedensky

Page 86, 128th dichotomy, change "128" before "*A. leucanthum* C. Koch" to "174".

Page 89, 153rd dichotomy, change "122" before "*A. fibrosum* Regel" to "112".

Page 96, 209th dichotomy, change "209" before "*A. monophyllum* Vved." to "187".

CORRIGENDA

PLANT LIFE, VOL. 14. 1958

Page 26, 2nd and 4th lines from bottom, for "*traubara*" read "*traubiana*".

Page 59, 3rd, 4th and 10th lines from bottom, for "*degraafara*" read "*degraafiana*".

5th line from bottom, for "*pearceara*" read "*pearceana*".

11th and 13th lines from bottom, for "*stoutara*" read "*stoutiana*".

15th and 17th lines from bottom, for "*yeldara*" read "*yeldiana*".

CORRIGENDA

PLANT LIFE, VOL. 15. 1959

Page 16, 23rd line from bottom, for "damazana" read "damaziana".

Page 23, 1st line, for "Al" read "A. P."

Fig. 4, caption, for "A. C." read "A. P."

Page 36, 3rd line from top, for "intermermediis" read "intermediis".

Page 38, under "2. ZEPHYRANTHES BRAZOSENSIS"

At the end of the first paragraph, add: ", *nomen subnudum*."

After the third paragraph, beginning with "NOTES.—", add:

[CORRIGENDA, PLANT LIFE VOL. 15. 1959, continued on page 78.]

Dedicated to

Prof. Ira S. Nelson

Herbert Medalist—Ira Schreiber Nelson, B. S., M. S.

IRA SCHREIBER NELSON, B. S., M. S.

An autobiography

To say that I was proud and pleased upon being notified that I was to receive the HERBERT MEDAL is a gross understatement. A very wise provision, however, tends to shrink swollen egos—the preparation of an autobiography as a prerequisite to this very great honor. As I write this introductory paragraph after having written the sketch which follows, I must confess that I have been humbled by the realization that I have taken so long to do so little. My only accomplishments which did not diminish as I wrote this are my children, three daughters and a son. Come to think of it, my wife has been playing the star roll in this category.

I was born on February 12, 1911, at St. Joseph, Missouri. Early childhood was spent on the farm where I enjoyed the freedom of fields and woods with an older brother and younger sister. When I was seven the family moved to town but for many years we returned to the farm for the summer months. I have vivid memories of the crop harvests, the paw-paw, *Asimina triloba*, patch, the bag swing in the big elm tree by the barn, the blacksnake that swallowed a glass nest-egg and countless other things that are commonplace for country youngsters to remember.

My father's determined fight to control soil erosion and to improve the productivity of his land made a lasting impression on me. This, I think, opened my mind to the possibilities for a career in some phase of scientific agriculture although I am not aware of the exact time when I made this decision. Constant encouragement from both my mother and father kept alive my interest in plants.

After completing elementary and secondary schools in the St. Joseph public school system I entered IOWA STATE COLLEGE where I majored in horticulture. To satisfy the senior-project requirement I spent the summer following my junior year on a field trip inspecting the horticultural plants and enterprises of Mexico. This trip, which I made alone, gave me my first real view of tropical vegetation and a tremendous urge to see more of it.

After receiving the Bachelor of Science (B. S.) degree and working for a year, I married Barbara Furnas of Wichita, Kansas, and returned with her to IOWA STATE COLLEGE to do graduate work in horticulture. With the help of her paycheck and by alternating work and schooling, I earned the Master of Science (M. S.) degree.

By February of 1941, I had joined the faculty of the COLLEGE OF AGRICULTURE at SOUTHWESTERN LOUISIANA INSTITUTE as Professor of Horticulture. Here I have remained except for brief periods of graduate studies at the UNIVERSITY OF MISSOURI and CORNELL UNIVERSITY.

To every teacher there is deep satisfaction in the success of former students. It is with no small pride that I see SOUTHWESTERN LOUISIANA INSTITUTE graduates in horticulture succeeding as commercial florists and nurserymen, serving on the horticultural faculties of some of our

great universities and doing graduate work in various sections of the country. I like to believe that I have played some part in guiding them to success.

Besides teaching, for which I am paid, I keep active in other phases of horticulture. For a number of years I have been show manager for both the state Iris and Camellia societies. I have held office in the AMERICAN IRIS SOCIETY and the AMERICAN CAMELLIA SOCIETY and am Director of Research for the LOUISIANA SOCIETY FOR HORTICULTURAL RESEARCH. I am a member of the SOUTHERN ASSOCIATION OF AGRICULTURAL WORKERS and several organizations devoted to special plants. I am a member of the AMERICAN PLANT LIFE SOCIETY and the affiliated AMERICAN AMARYLLIS SOCIETY, an Overseas Fellow of the ROYAL HORTICULTURAL SOCIETY and a member of Sigma Xi. THE NATIONAL COUNCIL OF STATE GARDEN CLUBS honored me with the SILVER SEAL AWARD and the AMERICAN CAMELLIA SOCIETY made me a Fellow of that organization.

Since 1941, I have been actively engaged in breeding Louisiana irises. In this connection I take pleasure in the knowledge that I have had a part in the development of wild Louisiana Irises as garden subjects. One of my seedlings, 'Cherry Bounce', was given the DEBAILLON AWARD, the highest award made to a Louisiana *Iris*, by the AMERICAN IRIS SOCIETY.

For a number of years I have served as judge for all American Rose, Annual Flower and Camellia Selections, and as an accredited judge of Irises, hemerocallis and camellias. This work has made me keenly aware of the need for better cultivars among all types of garden plants.

For several years I have been breeding *Amaryllis*. When this project was initiated an attempt was made to purchase species for foundation stock. To my great disappointment I was able to obtain only the scarlet *Amaryllis belladonna* L., *A. striata* and the Dutch and American hybrids. I soon realized that if species were to be used it would be necessary to reintroduce them from the wild. THE LOUISIANA SOCIETY FOR HORTICULTURAL RESEARCH had as its first major project this very objective, and I was fortunate to have been selected to go to South America in 1954 to collect *Amaryllis* species.

The success of the first trip was sufficient to justify a second trip which was made in 1958. These two expeditions have yielded at least ten species of *Amaryllis* in addition to others, still unidentified, which have not bloomed. Species of *Zephyranthes*, *Habranthus*, *Eucharis*, *Hymenocallis*, including subg. *Ismene*, *Lepidopharynx*, *Paramongaia*, *Bomarea*, *Crinum*, *Chlidanthus* and some 600 species of other plants were collected for their ornamental value. Detailed reports of these two expeditions will be found in the first four Bulletins of the LOUISIANA SOCIETY FOR HORTICULTURAL RESEARCH, and also in the 1955 AMARYLLIS YEAR BOOK (HERBERTIA) and in the present issue of the AMARYLLIS YEAR BOOK.

Three amaryllid species collected on these trips have proved to be new to science and have been properly described by Traub and Nelson.

They are *Amaryllis evansiae*, *Chlidanthus boliviensis* and *Habranthus cardenasiana*. The red Bolivian passion flower, *Passiflora coccinea,* which was collected on the first trip to Bolivia is now enjoying considerable popularity in southern gardens.

For the past 19 years I have had a rather heavy schedule of speaking engagements with FEDERATED GARDEN CLUBS in Louisiana and have taught horticulture in many of their schools. I have also participated in the programs of national conventions of the AMERICAN IRIS SOCIETY, AMERICAN HEMEROCALLIS SOCIETY, AMERICAN DAFFODIL SOCIETY and the WILLIAMSBURG GARDEN SYMPOSIUM. I have appeared on the program of both the Louisiana nurserymen's and florists' organizations and on the southeastern florists regional convention program. All of these as well as other speaking engagements in Texas, Arkansas, Mississippi, Alabama, Georgia and Florida have not only made me aware of the magnitude of ornamental horticulture but have also given me a deep concern for the mountain of unsolved problems in the field.

For many years we at SOUTHWESTERN LOUISIANA INSTITUTE have been assembling a collection of ornamental plants that are adapted to southern conditions. It is our ambition to see this institution become a fountainhead of first-hand information about ornamental plants for the south, and to be a perpetual source of living plant material for those who may have need for it. To this end we have worked out a system of plant records which makes it possible for anyone to quickly find out what our experiences with a given plant have been. Such a set-up is not a botanical garden nor an arboretum because the emphasis is on plants with ornamental horticultural significance, yet it embodies three of their basic features, the herbarium, the records, and the living plants. Perhaps the spirit of the great Liberty Hyde Bailey will not be offended if we call it a hortorium.

COLLECTING AMARYLLIDS IN SOUTH AMERICA

IRA S. NELSON

The writer has had the good fortune to have been able to make two plant exploration expeditions to South America; one in 1954, the other in 1958. These collecting trips which were jointly sponsored by the Louisiana Society for Horticultural Research and Southwestern Louisiana Institute had as one of their objectives the collection of *Amaryllis* species which were not otherwise available. Some of the results of these trips have been published in THE AMARYLLIS YEAR BOOK (HERBERTIA), the Bulletins of the Louisiana Society for Horticultural Research and elsewhere. This article will deal with the amaryllids collected during the second trip which was made during October, November, and December of 1958.

Cochabamba, Bolivia, was selected as a base headquarters because of its location in relation to other areas and its air facilities for the

shipment of plants. Some fruitful efforts were made in the Cochabamba area from which *Amaryllis vittata* var. *tweediana, Chlidanthus boliviensis* and an unidentified *Amaryllis* were obtained in 1954. *Amaryllis cybister* was collected at the base of Mt. Tunari at approximately 9,000 feet of altitude. It was in flower when collected on October 31, 1958, but no foliage was visible. This orchid-shaped *Amaryllis* species was found growing in almost pure deposits of half-rotted organic matter which had lodged in the crevices along the rocky slopes of a stream bank. Some of the bulbs were found under bushy deciduous plants while others were found in places completely exposed to the sun. The area has relatively light seasonal rainfall. Apparently, *A. cybister* produces its flower scapes and leaves early in the rainy season, makes its growth, then goes completely dormant during the dry season which ends in October. This area also yielded dormant bulbs which seemed to be amaryllids, perhaps species of *Habranthus* or *Zephyranthes*. These have not yet bloomed.

Amaryllis cybister was collected again on November 2, 1958, at Km. 145 on the Cochabamba—Santa Cruz highway. Here it was growing under similar conditions but in an area of somewhat less rainfall and at an altitude of 9300 feet. It was growing with *Zephyranthes tubiflora*, a large orange-flowered rainlily and an unidentified plant, the bulbs of which are the size and shape of bulbs of *Chlidanthus boliviensis*. These amaryllids were collected, but have not bloomed to date.

On November 3, 1958, a third collection of *A. cybister* was made at Comorapa, Bolivia, along the banks of a stream which runs between the airport and the town. This collection, unlike the others, had both leaves and flowers when collected. From the three stations visited, we may conclude that the primary cultural requirements of *A. cybister* are a light soil which is high in organic matter, good drainage and a long dry period following growth. This species thrives in areas subject to frosts and light freezes. *Amaryllis cybister* was collected at the Comorapa station in 1954 but the bulbs did not survive. It was not identified until collected again from the same place in 1958.

Amaryllis bulbs which were in full leaf but not in flower were collected in Yungas of La Paz at Km. 63 between La Paz and Irupana at approximately 6700 ft. altitude on November 7, 1958. This station is in an area of heavy rainfall and is apparently frost free. The bulbs were growing in deposits of pure organic matter about 3 inches deep which had accumulated on top of large rocks that were in rather dense shade. One of the bulbs has since bloomed in the greenhouse at Southwestern Louisiana Institute and has tentatively been identified as *A. forgetii*, a species not previously reported from Bolivia.

At Km. 90 on the La Paz-Irupana highway *Amaryllis* bulbs which were not in bloom were collected on November 6, 1958, when we were enroute to Rio La Paz. Dr. Martin Cardenas who was on this trip remembered the station from previous trips he had made by mule back years earlier. These bulbs have since proved to be *A. pardina* as Dr. Cardenas had predicted. The bulbs were found growing on a partially

shaded steep bank beside the road near a place called El Chaco. The altitude at El Chaco is slightly under 5000 ft.

Below Irupana on the road to the ford at Rio La Paz where a highway bridge crosses a stream at 4650 ft. altitude, *Amaryllis* bulbs were collected. These have not bloomed and remain unidentified. They do not appear to be *A. Pardina*.

Dr. Martin Cardenas planned the trip to Yungas of La Paz with a primary objective, the collection of *Lepidopharynx deflexa*. When he was a member of the Mulford Expedition 37 years earlier, he had seen it growing on the steep slopes where Rio Miguella joins Rio La Paz. Dr. Cardenas' memory seemed infallible. On many occasions he would go to an exact spot to find plants, which he had not seen for years. Never once did he refer to notes to refresh his memory.

Although *Lepidopharynx deflexa* was not in bloom when collected on Nov. 7, 1958, it was identified in the field by the flowers of a few withered scapes which were still attached to the bulbs. *Lepidopharynx deflexa* was growing on a nearly vertical south slope a few feet above the flood-line of the river. The slope had a coverage of shrubs and trees which afforded partial shade. The entire area is quite warm the year around at the relatively low altitude of 3586 ft. above sea level. This station, which is the type colony of *Lepidopharynx deflexa,* is near the edge of a heavy rainfall area.

A few kilometers up Rio Miguella from its junction with Rio La Paz other *Amaryllis* bulbs were collected in deep shade. They were growing in the leaf mold on the steep forest floor. These were not in bloom on Nov. 7, 1958, and have not yet bloomed at this writing. The altitude of this station is 3658 ft., essentially the same as for the previous station which is near by.

A three-day trip was made to San Antonio, Bolivia, from Cochabamba by truck Oct. 15-17, 1958. This trip yielded at least three and possibly four amaryllids. A species of *Eucharis* was collected in the rain forest at 1,550 ft. elevation. It was growing in rather dense shade and on flat land. *Amaryllis reginae* was collected from cultivation as were two other *Amaryllis* which were not in bloom when collected November 17, 1958. One of these was said to be white, the other pink. They have not yet bloomed at Lafayette, La.

Dr. Martin Cardenas had a most unusual chartreuse-flowered *Amaryllis* in bloom in Cochabamba which had been sent to him two years earlier by Rev. Fr. Lorenzo Hammerschmidt of San Ignacio, Bolivia. Dr. Cardenas and the writer flew to this isolated pueblo to spend a week collecting with Fr. Lorenzo. This *Amaryllis,* one of the *A. elegans* alliance, was collected in bloom on Oct. 20-26, 1958, between San Ignacio and San Miguel at 1250 ft. elevation. It was again collected near San Javier at 2000 ft. on November 14, 1958, and on December 12, 1958 at 2480 ft. near the village of Santiago, Bolivia. Dr. Cardenas describes this long-trumpeted species in this issue of Herbertia as *Amaryllis elegans* var. *divifrancisci* Cardenas. It offers another source of yellow color to *Amaryllis* breeders.

A second *Amaryllis* was collected in the San Ignacio area. Unlike the preceding one it was found on a hillside instead of on the relatively flat pampas and growing in dense shade instead of in partial shade. It was not in bloom but could be readily distinguished by its wide leaves which were almost horizontal. This collection was made on Oct. 19, 1958 at an elevation of approximately 1600 ft.

Amaryllis belladonna was collected over a wide area. The usual forms were found in the Santa Cruz, San Javier, San Ignacio and Santiago areas. An especially fine rose colored clone was collected from cultivation in the Evangelical Mission yard in Santa Cruz. This clone is unquestionably *A. belladonna* but is superior in color and form to the typical form. It is one of the most beautiful *Amaryllis* that the writer has seen.

Enroute back to the United States a brief stop was made in Peru on Dec. 18-19, 1958. Dr. Raymond Ferreyra and Ing. Joseph Tosi very kindly drove the writer about 120 miles north of Lima where *Paramongaia weberbaueri* was collected at Lomas de Lipin. This was found in a dormant state in crevices of rocks which had been completely filled with organic matter. Although the area is desert, a brief rainy season gives enough moisture for this plant to survive. The altitude here is 1085 ft. above sea level. In the same area a *Stenomesson* species was collected in bloom.

In all, the collections include 7 *Amaryllis* species for certain and possibly as many as five more which have not been identified, as well as species of *Habranthus, Zephyranthes, Lepidopharynx, Paramongaia, Eucharis* and *Stenomesson*.

It would be an injustice not freely to acknowledge the aid which was generously given by many people in South America. Although space does not permit acknowledgement to each person who contributed to the success of the expedition, the following persons contributed in numerous ways toward the collection of the amaryllids: Dr. Martin Cardenas, Wenislow Obando, and Lucio Arce, all of Cochabamba, Bolivia, and Joseph Tosi and Dr. Ramon Ferreyra of Lima, Peru. The writer is indebted to the Franciscan Fathers of San Ignacio, Bolivia, the Rev. John Breman of San Javier, Bolivia, and the Rev. George Haite of Santiago, Bolivia, for board, lodging and transportation in their respective areas; and to Anne Krieger of Santa Cruz, Bolivia, for aid in the shipments of plants from the Santa Cruz area.

There are still many *Amaryllis* species in South America which should be collected. These are not only of great scientific interest but are also potentially valuable for use in improving our garden *Amaryllis*.

PHOTOGRAPHY IN YOUR GARDEN

DAVE FORBERT *

It is generally thought that one active hobby is more than enough for the average person these busy times, but the flower enthusiast who also likes photography is in a position to get double enjoyment from his garden. He does this by shooting color slides of his choice blossoms or flower arrangements during their peak blooming season. Then when winter comes he can bring it all to life again by projecting them on a screen. Color photography is also a perfect way of keeping a permanent record of your flower bed arrangements: what was planted next to what, how the color harmony looked, etc. If each bed is photographed several times during the summer and the slides properly dated and identified it will be of tremendous value in future planning.

Most cameras on the market today have adequate lenses for garden photography, however, if you are about to buy a camera for your new hobby there are several points you should first consider. First you must decide if you want small economical 35mm color slides or larger 2¼x2¼ slides which are more impressive on the screen but also cost considerably more to produce. Generally speaking the two sizes of cameras will cost about the same so the only big problem is film cost. Also to be considered is the fact that some people will shoot more pictures than others; therefore if you plan to shoot in quantity your best bet will be 35mm which gives you 36 (or 20) exposures to a roll and is cheaper than the #120 (2¼x2¼) film which gives you only 12 pictures to a roll of film. On the other hand if you shoot few pictures you might be happier with the more expensive 120 film size. My only advice here would be to buy which ever your pocket book can best afford.

In the 35mm category I recommend the single lens reflex type camera. This type of camera offers the advantage of being able to see your actual picture on a ground glass. Of course the regular optical viewfinder type 35mm camera is also an excellent tool and can be had at a more reasonable price than the reflex type. You have a wide choice of cameras here from $30 on up to $500.

In the #120 (2¼x2¼) size camera I again recommend the reflex type and their prices range from about $40 on up to $500.

Now that we have a camera, lets take pictures of our garden. In outdoor shooting the first thing to consider is lighting. The relationship between the position of the sun and the single flower blossom or bed of flowers can make all the difference between a snapshot and a dramatic photograph. Outdoor lighting might be broken down into the following headings:

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* Dave Forbert, the talented photographer, is the son of Mr. & Mrs. Sam Forbert, of Hattiesburg, Miss. He graduated with highest honors from the School of Modern Photography in New York, and is now head of the Readers' Digest photography staff; his wife Amy Daly Forbert serving as his research assistant. Dave and Amy Forbert, with daughter Leslie live in New York City. **—Hamilton P. Traub**

FRONT LIGHTING: The sun coming from behind the camera and shining directly on the front side of flowers. (Care must be taken not to show your own shadow in the picture with this type of lighting.)

TOP LIGHTING: The sun coming from directly above the flowers causing shadows to go straight down. As a rule noontime is a bad time of day to shoot pictures of your garden, particularly closeups due to the fact that the supporting stems will be in deep shadow.

SIDE LIGHTING: The sun striking the flowers from either extreme right or left. This is often referred to as texture lighting and is very effective in bringing out the three-dimensional character of flowers.

BACK LIGHTING: The sun coming from behind the flower. This type of lighting is a favorite for translucent blossoms such as tulips, gladiolus, daffodils, and amaryllis. Since the sun will be shining almost directly into the lens of the camera it might be necessary to shoot from a very low camera angle in order that the sun will be hidden behind the flowers. Or you might have a friend shade the lens by holding his hand or hat high above the lens blocking the sun.

In shooting your close-ups with any of the lighting directions listed above you might find it desirable to fill in the shadows with either artificial light (blue flashbulbs) or a white piece of cardboard or newspaper, used to reflect sunlight into the shadows. This is almost a necessity in backlighting pictures since the non-translucent stems and some flower leaves will need light to bring out their color—otherwise they would appear in silhouette.

The backgrounds in flower photographs should be as simple as possible in order to keep the attention focused on the subject, and to keep the picture from looking cluttered. It is therefore advisable to move in as close to the flower as possible and try to find a neutral background such as the side of the house, a solid fence, or shoot from a low angle and use the blue sky as your background. If none of these are possible you can buy at a reasonable price from an art supply store a set of colored cards suitable for backgrounds. But remember in shooting color that you do not want to drown the flowers subtle colors by using bright colored backgrounds. As a matter of fact I recommend a set of perhaps four or five colored cards, (i.e. a soft blue, pale green, gray, a soft yellow and a pure black). The latter is especially good for getting stark contrast with light colored flowers. Naturally these colored cards can also be used for your indoor shots of arrangements.

When shooting indoors you have more control over your lighting since you can move your flowers and light to achieve the best effect. The one thing you must keep in mind however, is that you want your lighting to look natural—as though it were sunlight or, in other words it should have one main light source (like the sun) with additional lights used only to fill in shadows, light background and accent certain areas. When shooting color film indoors you must be sure to consult the instruction sheet which is packed with the film concerning the type of lights to use, filters, etc. As for the type of film to use, Kodachrome is still a favorite even though its speed is considerable slower than the

newer films such as Ektachrome-Professional, Anscochrome, and Super Anscochrome. However, since Kodachrome is not made in the #120 film size your best bet here is Ektachrome and Anscochrome. I do not recommend the faster super Anscochrome and Ektachrome-Professional for flower photography unless you are shooting pictures under very unfavorable lighting conditions. The faster films do not seem to be as true in color as the slower films. As for exposure I strongly recommend a photo electric exposure meter for those who plan to take their photography seriously and who want the best possible results. However unless you plan to really master the use of the meter—which is tricky—you will be better off following the instructions packed with each roll of film. Color film is more critical in exposure than black and white and one must be pretty close to the exact exposure to achieve best results.

Unfortunately due to limited space it is only possible here to touch on a few points that might help make better garden pictures. I recommend that you use this short article only as a starting point and consult a good book on fundamental photography, which is available from the public library or your local camera store.

SOUTHERN RHODESIA NEWSLETTER, 1959

SYDNEY PERCY-LANCASTER

After a life time in India—fifty six years of it spent in active horticultural service—my wife and I decided to settle down in S. Rhodesia with our son, who is also a gardener. Leaving Bombay in early February (1959) by the S. S. Karanja we stopped for a day at the Seychelles and I took the opportunity of visiting the chief island, Mahé, to see the Double Coconut in the Botanic Gardens at Victoria. It was a Sunday and the guards were on leave so that vandals were busy inscribing their names on the several green fruit that were within reach. I had long wished to see the Palm on which the Double Coconut grew and at last my wish was gratified. There may be among the readers of this article some who may never see this palm in the Seychelles and I give a few notes I made about *Lodoicea seychellarum* at the time.

The Seychelles are a group of 92 islands of which Mahé is the largest; about 17 miles long by 5 miles wide. The Double Coconut is only found in a natural state on one island that is off the beaten track. Nuts however have been distributed to different tropical parts of the world while numbers of the palm are growing in Mahé. I had previously seen a small specimen of this palm in Calcutta (India) and the bilobed nuts, freed of the husk, as well as polished specimens, and various ornamental dishes, boxes, bowls, etc. made from the nuts, had passed through my hands for a Peace Celebration Exhibition after the First World War.

The palms in this garden are possibly 20 to 30 years old, the male specimen being eighteen or more feet tall and the females slightly less. The leaves of the male are larger than those of the female and measure 6-8 feet wide by 9-12 feet long, without the petiole, which must have

been 8 feet long. The leaves are palmate, intermediate between those of *Styloma (Pritchardia) pacifica* and *Sabal unbraculifera.* The male carried long pendant spadices, 3-4 feet long and 3-4 inches in diameter, while the trunk diameter was some 15 inches at the base. The female palms were slightly smaller and the fruit carrying spikes were 3-5 feet long; on some a solitary fruit appeared but five seemed to be the maximum on the plants seen. The fruit, when first pollinated, appears like a gigantic black acorn in a nine inch diameter cupule, a couple that were possibly more advanced, resembled three sided Coconuts *(Cocos nucifera)*. The fruit in the husk at maturity measures 12-15 inches in width, 18 inches in length and 9-12 inches in depth. I could not get the weights but the largest could not have been less than 20 lbs. The popular names of this palm are *Coco-de-mer,* and *Maldive Nut,* the first fruits having been found on the sea shore of the Maldive Islands and, as it is not considered possible for a land plant to carry so large a fruit the COCONUT OF THE SEA was a natural sequence. The Double Coconut grows to a height of 100 feet but a fully matured specimen takes a century to reach this height. The nut is the largest known fruit in the world and specimens have weighed as much as 50 lbs. but the great majority are about half this. The Palm does not commence fruiting till it is 20-30 years old and from the time of flowering till a fruit is mature ten years may elapse.

On reaching the coast of Africa the famous Baobab *(Adansonia digitata)* was seen in numbers but what a difference between these and specimens growing in different parts of India. The African Baobabs are stunted, with gouty trunks that must have been 20-30 feet in diameter at ground level. One specimen, measured at Mombasa, was between 15 and 18 feet. Neither Mombasa, nor Dar es salaam, had any outstanding plants to attract my attention. We disembarked at Beira for the train journey to Salisbury and my son, who had come to welcome us to the new country, took us round the station. He discovered a yellow *Gloriosa* resembling *G. superba* in shape of flower, but the foliage growth was different.

We left Beira at nightfall and traveled through Portuguese territory all night reaching S. Rhodesia in the morning. En route we saw masses of *Bauhinia galpinii,* huge bushes or rambling up trees to a height of 15-20 feet. *Aloe* and *Tritoma* were also seen wild and on either side of the railway track, at intervals, appeared drifts of *Cosmos*, the three common colours, and *Tithonia speciosa,* probably escapes from some garden. Salisbury, the capital, is 5000 feet in elevation and enjoys reverse seasons to what we have been accustomed. We arrived at the end of summer and in August are having winter weather, but temperatures are mild. The coldest night so far has been 39 degrees, usually the thermometer registers 40-50 degrees. The day temperatures range from 65 to 80 degrees. A number of the trees that grow in India at low elevations appear to thrive here for I have seen *Delonix regia, Bauhinia variegata, Spathodia campanulata, Cassia multijuga* and other species, *Cedrela toona, Jacaranda mimosaefolia,* etc. *Largerstroemia indica,*

Hibiscus in great variety, *Euphorbia pulcherrima (Poinsettia)* are well represented. I have been to two Shows in Salisbury, but the exhibits failed to show the wild flora of the country in which I am more interested than the cultivated species, and I am looking forward to scour the countryside as soon as Spring and Summer bring the dormant plants to life.

I was fortunate, through the kindness of the Director of the National Botanic Gardens, Lucknow (India), in being able to bring with me a collection of *Zephyranthes (Cooperanthes)*, as well as a few *Amaryllis*. Some "out of season" flowers of both have already opened and I have raised seedlings of *Amaryllis* and of *Zephyranthes*. Among annuals I was interested in *Cosmos*, *Hollyhock* and *Petunia* and seeds sown on arrival have bloomed and the opportunity taken of cross breeding. I have therefore quite a number of irons in the fire.

We have a number of *Gloriosa* growing in my son's garden, some that came from India and others collected in Africa, these should flower during the Summer. My son has also collected bulbs of *Boophane (Buphane) guttata* (?), and a white form, and a few wild *Gladiolus*. A visit to a National Park introduced me to a collection of Aloes, most of them were in bloom and the flower ranged in colour from yellow through shades of orange to a deep scarlet. We have at least a dozen species in our garden collected locally. In this Park were a fine collection of *Encephalartos* as well as other succulents and Cacti but the specimen of *Portulacaria afra*, 12-15 feet high, made me rub my eyes in wonder. In India the oldest specimens were never more than four feet.

I trust that in my next letter Dame Flora will oblige and the beauties of S. Rhodesia be worth writing about.

[It is gratifying that Mr. Percy-Lancaster, who is now in his seventy-third year, is still hale and hearty and will keep us in touch with a most interesting part of the world with an annual newsletter. He is especially interested in *Zephyranthes*, including *Cooperia*, *Amaryllis* (syn.-*Hippeastrum*), other *Amaryllidaceae*, some of the *Iridaceae* and *Liliaceae*. He has *Amaryllis cybister* and hybrids of it, *Amaryllis recticulata* hybrid, clone 'Mrs. Garfield', *Amaryllis stylosa*, *Amaryllis belladonna* (syn.-*H. equestre*) and a half dozen of the Dutch Leopoldii (flat) type hybrids. Those who are in a position to assist Mr. Percy-Lancaster in his breeding work by furnishing additional material are requested to write to him at 799 Mansfield Road, Marlborough, Salisbury, Southern Rhodesia.—*Editor*.]

[**AMARYLLID NOTES, 1960,** continued from page 38.]

greenish. Thus this clone is almost the same as 'Harrison's Orientred'. Our plant does not seem to be as free-flowering as the named clone. It appears to have somewhat more whitish in the flower and thus could be used in breeding for a white *Sprekelia*.

Fig. 2. Queen of the New Orleans 11th Official Amaryllis Show, 1959. Miss Donna Gayle Mackenrath is crowned by Commissioner-at-large Victor H. Schiro.

1. REGIONAL ACTIVITY AND EXHIBITIONS

OFFICIAL NEW ORLEANS AMARYLLIS SHOW, 1959

MRS. A. J. HAYDEL, *Chairman*

The 11th Official Amaryllis Show at New Orleans with the theme "A Melody Tour", sponsored by The Garden Circle, affiliated with the American Amaryllis Society, the Federated Council of New Orleans Garden Clubs, the Louisiana State Federation of Garden Clubs, was held March 21-22, 1959 at Eleanor McMain School. Sixty-seven Garden Clubs participated in artistic arrangements and horticulture divisions.

Mrs. A. J. Haydel was Show Chairman, and Mrs. W. J. Perrin, Honorary Chairman.

The arrangements were judged by six accredited Judges and the horticulture entries were judged by twelve Amaryllis judges. Mrs. William Derbuesse received the Silver Tray for the most outstanding arrangement, labeled "Sailing, Sailing". Mrs. Sheryl Schlotter won the Gold Cup for the Junior Arrangement, "Deep in the Heart of Texas".

Mrs. A. J. Haydel [Fig. 3] won the Ludwig Challenge Cup for the best Ludwig specimen—'Apple Blossom' (Ludwig); the Reuter Seed Co. Trophy; the Sweepstake Award Gold Cup, for the most outstanding Dutch specimen—'Apple Blossom' (Ludwig).

Mrs. Harry St. John won the Harry St. John Memorial Challenge Cup Trophy for the most outstanding registered American Hybrid, 'Harry St. John' (St. John, 1957); and also the La Forest Morton Memorial Trophy for an American Hybrid, This latter was a Sweepstake Award in American Hybrids.

The Junior Horticulture Award was won by Ronnie Catalanotta.

The following AMERICAN AMARYLLIS SOCIETY awards were made:

'Daintiness' (Ludwig), **AWARD OF MERIT;** exhibited by Mrs. John Cucurullo.

'Fire Fly' (Ludwig), **AWARD OF MERIT;** exhibited by Mrs. A. J. Haydel.

Unnamed clone, **AWARD OF MERIT;** exhibited by Mrs. John Klein.

'Little Sweetheart' (Ludwig), **AWARD OF MERIT;** exhibited by Mrs. Emile Malbrough.

'Cardinal' (Ludwig), **AWARD OF MERIT;** exhibited by Mrs. W. J. Perrin.

'Harry St. John' (St. John, 1957), **AWARD OF MERIT;** exhibited by Mrs. Harry St. John.

The educational exhibits were displayed by Mrs. W. J. Perrin and Miss Judy Bowers.

The Official Amaryllis Queen of New Orleans, Miss Donna Gayle Mackenrath, was crowned by the Hon. Victor H. Schiro. [Fig. 2.] The 1957 Queen, Miss Heannie Wolf presented the maid, Miss Bethny Seruntie. The crown bearer was Miss Paula Jefferson, and the Registrars were Miss Lynn Latapie and Sharon Jacobs.

The Amaryllis Dance was directed by Mrs. Andree Gelpi, with dancers from Kingsley House, including Shirley Bivalacqua, Connie

Callaghan, Terry Canfill, Christina Callaghan, Karen Canfill, Barbara Griffin and Gaynell Tanisa.

Fig. 3. Mrs. Antoine J. Haydel in the greenhouse with some of her choice named hybrid *Amaryllis* clones. New Orleans, Louisiana, spring 1959.

1959 OFFICIAL MEN'S AMARYLLIS CLUB SHOW

Emile Malbrough, *New Orleans, Louisiana*

The Men's Amaryllis Club of New Orleans under the chairmanship of Mr. Emile Malbrough, with Mr. Edwin Authement as co-chairman, presented its Second Annual Amaryllis Show on April 4th and 5th, 1959 at the Bienville School. Five gold cups, five American Amaryllis Society awards of merit, and other awards were presented to the winners. Six accredited amaryllis judges, after careful consideration of over 250 entries, (approximately 200 of which were registered Dutch blooms), decided the winners of the following awards to be:—

Mr. Milo Virgin, winner of the tri-color award for his 'Superba' entry in the registered Dutch hybrid class. This is the second consecu-

tive time Mr. Virgin has won this award at a show presented by this organization.

Mr. Tim Calamari, sweepstakes winner in the Dutch hybrid class and recipient of the "President's Trophy", given to a member of the club for the most blue ribbons in the show.

Mrs. Harry St. John, tri-color award for her entry 'Harry St. John' in the American hybrid class.

The winners of the AMERICAN AMARYLLIS SOCIETY awards of merit were as follows:

Mr. Timothy Calamari for 'Ludwig's Goliath' and 'Ludwig's It'; Mr. Henry Fonteuberta for 'Audrey'; Mr. S. P. Gasperecz for an unnamed Dutch seedling, and Mrs. R. E. Duggen for a red American seedling.

The show is entirely horticulture and open to all amaryllis lovers. Along with two educational displays, and literature, the members of the organization gave first hand information on the growth and care of amaryllis to all of the guests. Members of amaryllis clubs from cities in the surrounding area along with many local citizens viewed the show and expressed their pleasure and congratulations for a fine presentation.

MEN'S AMARYLLIS CLUB SHARES IN GARDENING RENAISSANCE

SANTO N. CUSHINETTO, *Corresponding Secretary-Treasurer*

During the past two years garden clubs in the New Orleans area have increased 35% and now number 109. It was during the advent of this era that the MEN'S AMARYLLIS CLUB of New Orleans was organized. This club, now well established, has increased its membership 60% during the past year, publishes its own monthly newsletter, and has sponsored two successful Amaryllis Shows. Its members promote the growth of Amaryllis, take part in, and cooperate with flower shows.

Newly elected officers are H. P. Fonteuberta, President; W. J. Perrin, Vice-President; Jules X. Wille, Corresponding Secretary; Santo Cuchinotto, Recording Secretary and Treasurer. Mr. Fonteuberta has years of experience in gardening activities and is well qualified to head this growing club.

FIRST OFFICIAL AMARYLLIS SHOW, VALDOSTA, GEORGIA

BECKWITH D. SMITH, *Jacksonville, Florida*

Upon invitation of Mr. Guy L. Rice, President of the VALDOSTA MEN'S GARDEN CLUB and Show Chairman, Mrs. Smith and I attended the two day OFFICIAL AMARYLLIS FLOWER SHOW held at the Valdosta Garden Center, 900 North Patterson St., Valdosta, Georgia, Saturday and Sunday, April 18-19, 1959. We entered ten cut scapes from our

collection of Amaryllis and were gratified at winning two blue, two red, and three yellow ribbons.

The show was conducted along the lines outlined by the AMERICAN AMARYLLIS SOCIETY. Divisions were:

1. The Outstanding Horticultural Entry in the Show.
2. The Best Named Clone Grown in a Pot.
3. The Best Unnamed Clone Grown in a Pot.
4. The Best Named Clone; cut specimen.
5. The Best Unnamed Clone; cut specimen.
6. The Best Entry From the Hybridizer's Class.

There were 27 entries in the Artistic Division and 174 entries in the Horticultural Division. Awards of Merit were given by the AMERICAN AMARYLLIS SOCIETY to: J. Ritchie Rosa, Tallahassee, Fla., for outstanding horticultural entry; to Mrs. D. W. Lawton, for best named clone grown in a pot; to Guy L. Rice, for best unnamed clone grown in a pot; to Mrs. Oscar Kennon, for best named clone, cut specimen; to Mrs. J. A. Fausett, for best unnamed clone, cut specimen; to J. Ritchie Rosa, Tallahassee, Fla., for best entry from the hybridizer's class. Special awards of green ribbons were given to Clyde Carter and J. Ritchie Rosa. Tri-color ribbon for best entry in the show was awarded to Mrs. O. S. Ware by the Garden Club of Georgia.

The show was well attended by residents of Valdosta and by numerous out of town visitors from Alabama, Florida and Georgia. After the show on Saturday, April 18th, visitors toured the beautiful garden of Mr. & Mrs. Guy L. Rice, where hundreds upon hundreds of hybrid Amaryllis were growing, all developed by them over a period of years. Most were in the red shades, as well as orange and salmon, and many near whites and pure whites.

Saturday night, April 18th, members, visitors and their wives attended a banquet at Ashley Oaks Motel Dining Room, where all were most interestingly entertained by a talk by Prof. Ira S. Nelson, Director of Horticulture at Southwestern Louisiana Institute, Lafayette, Louisiana, and who showed colored slides of rare Amaryllis species brought back from Bolivia by him in 1954. The consensus of everyone who attended this show was that it was worth continuing in future years, so it is hoped that many more shows will be held subsequent to this initial Official Amaryllis Show at Valdosta in 1959.

[**EDITOR'S MAIL BAG,** continued from page 28.]

hybridizing *Cyrtanthus* for the past two years, and reports that he got "a very fine break which is far finer than any of the genus—4" to 5" bulbs, throwing an 18" stem crowned with from 4 to 9 trumpets 2" long x 1½" across, a glowing 'ember' colour, the petals dusted with gold (reminiscent of *Nerine sarniensis*). It is a beauty, and selfed, its seeds is producing some even better. These haven't increased enough to sell. My *Cyrtanthus sanguineus* I am selling at 5/- a bulb or 4/- each for large quantities."

FIRST OFFICIAL SHOW OF THE HATTIESBURG AMARYLLIS SOCIETY, 1959

The Garden Center was the scene on May 2-3 of the first official Amaryllis show to be held in Hattiesburg under the sponsorship of the Hattiesburg Society, an affiliate of the American Amaryllis Society. Long tables of potted blooming Dutch and American hybrid bulbs, scores of cut specimens, artistic arrangements, and an educational display were evidence that the local Society is achieving its objective: "To promote

Fig. 4. Hybrid *Amaryllis* clone 'Ludwig's Dazzler' (Ludwig). This fine specimen was grown by Mrs. R. A. Fowler, and won a blue ribbon at the First Annual Official Amaryllis Show at Hattiesburg, Miss., 1959.

a fuller appreciation of a most majestic and beautiful flower, the Amaryllis." Blooms on display ranged in color from purest white of 'White Giant' through varying shades of pinks and salmon to the deep crimson of 'Alcyone'.

Through the cooperation of several local firms, seven sterling silver goblets were awarded to local gardeners for outstanding entries. The President's cup, given by Mrs. Sam Forbert, president of the local Society, for the most blue ribbons in show, was won by Mrs. R. A. Fowler. The R. A. Fowler Memorial award, given by Mrs. Fowler for the most outstanding horticultural potted specimen of Dutch Amaryllis

Fig. 5. Hybrid *Amaryllis* clone 'Fire Dance' (Ludwig). This well-grown specimen was among the best in the First Annual Official Amaryllis Show at Hattiesburg, Miss., 1959. The specimen was not entered in competition; it was grown by Mrs. W. H. Sparrow, and placed among the educational exhibits.

in the show, was awarded to Mrs. J. W. Snowden's, 'House of Orange'.

Mr. W. D. Morton, Jr., an official of the American Amaryllis Society and Registrar of American hybrid clones, attended the show and made three official Amaryllis Society Awards of Merit. These honors went to Mrs. J. W. Snowden's, 'House of Orange'; Mrs. C. R. Bethea's, 'Five Star General'; and Mrs. V. J. Lucas', unnamed American clone.

Mrs. A. C. Hopton, Mrs. N. J. Furr, and Mrs. Everett Hughes of Jackson; Mrs. Jeff Brown, Mrs. Hunter Kilpatrick, W. R. Lowe, W. C. Strain and Harry McCarn of Mobile and T. C. Calamari of New Orleans, National Accredited Amaryllis judges, scored the exhibits.

MOBILE AMARYLLIS FORUM

LOU COSTA, *President*
356 McMillan Avenue, Mobile, Alabama

When the MOBILE AMARYLLIS FORUM was established in September, 1958, the adopted objective was stated as "the pursuit of knowledge in every phase of amaryllis culture" as it applied to this Gulf Coast area. Events since that time have amply demonstrated the sincerity of its members in their determination not to be diverted from that policy.

Monthly meetings have been held continuously—even through the hot summer months. These have consisted of very brief and harmonious business sessions followed by lectures, demonstrations, round table discussions, panel shows and the showing of slides. Garden tours were taken in season and an Amaryllis Show held.

For its first Show, the AMARYLLIS FORUM staged a small, private event, but it was complete in practically every detail. With separate divisions for horticulture and artistic arrangements, there were the customary donated silver trophies with prizes and ribbons awarded in each section and classification. But what we feel was most important to members and invited guests was the unique judging experience: the judging, with all its attendant discussion, was performed openly and aloud for all to hear and observe. This, we feel, was a liberal education in itself. Each prize and award was fully explained and justified while each feature or criticism was heard by the entire assemblage.

At present (August, 1959) we are in the midst of a course of study subscribed to by the entire membership. Each meeting comprises one full lesson, with texts and illustrations. From these lectures under tutelage of "Prof." Bob Parker all of us expect to learn much, but more than that, we hope some of us will be able to take—and pass—the examination for AMARYLLIS JUDGE'S CERTIFICATES. This is something really worth while striving for—the first in Mobile!

COASTAL BEND AMARYLLIS SOCIETY (TEXAS)

Amaryllis growers in Corpus Christi, Texas, held meetings in May and June, 1959, which led to the formation of the COASTAL BEND AMARYL-

LIS SOCIETY and will sponsor the Amaryllis division of the Lola Forrester Flower Show held at Corpus Christi each spring. It is thought that because of the favorable growing conditions along the lower coast of Texas and the widespread local interest in the *Amaryllis* as a garden plant, that this exhibition will become an outstanding one. Members of the club will also pursue their special interests in culture, collecting and breeding.

Officers elected for the first year were Fred B. Jones, Pres., Mrs. H. L. Harris, Vice-President, Mrs. W. H. Anderson, Secretary and W. L. Bates, Treasurer.

PARKER'S—AMARYLLIS JUDGING STUDY COURSE FIRST EDITION, 1959

In 1959, Mr. Robert E. Parker, 3051 Baronne Street, Mobile, Alabama, an accredited Amaryllis Judge of the American Amaryllis Society, brought out the first mimeograph edition of his "Amaryllis Judging Study Course" given by The Amaryllis Forum, Mobile, Alabama. This is based on the best available information and the subject matter is divided into five sections so that the course can be given in five sessions: (1) The plant and its parts; (2) Divisions of Amaryllis; (3) Score card; (4) Group entries in Amaryllis shows; and (5) Artistic arrangements. The Appendix consists of the catalog lists of registered Amaryllis clones furnished by the Official Registrar of Amaryllis Names of The American Amaryllis Society, Mr. W. D. Morton, Jr.

This is an excellent presentation and it is hoped that Mr. Parker will revise it in the coming years as further progress is made in this field. It is suggested that a list of references to the selected literature on Amaryllis and Amaryllis judging be added in future editions. Mr. Parker is to be congratulated for a job well done.

POSTSCRIPT.—The writer suggested to Mr. Parker that the Study Course might be made available to Amaryllis Judges generally and those preparing for examinations. He writes that "consideration is being given to making copies available if the response warrants it and if anyone is interested, he should inquire, indicating the number of copies that are needed, if inquiring for a group." Mr. Parker's address is: 3051 Baronne Street, Mobile, Alabama.—*Editor.*

HOUSTON AMARYLLIS JUDGES COUNCIL

The HOUSTON AMARYLLIS JUDGES COUNCIL was organized on July 22, 1959. The purpose of the Council is to increase the members' knowledge as accredited Amaryllis Judges of the AMERICAN AMARYLLIS SOCIETY so that they may become well-grounded in the Society's judging standards and may apply these standards in actual practice, and offer suggestions that may be of value in raising judging standards at Amaryllis shows.

All accredited Amaryllis Judges of the AMERICAN AMARYLLIS SOCIETY in the Gulf Coast Area may become members, and are urged to attend three meetings each year. Such meetings offer outstanding opportunities for exchanging information on judging Amaryllis.

Mrs. W. S. Wheeler, Pres., of THE HOUSTON AMARYLLIS SOCIETY acted as chairman of the organizing meeting. Officers of the Houston Amaryllis Judges Council are Mrs. E. L. Bachelor, Pres., Mrs. A. C. Pickard, 1st Vice-Pres., and Instructor; and Mrs. Frank S. Bova, Secy.-Treas.

The necessity of classes offering instruction for the OFFICIAL AMARYLLIS JUDGES CERTIFICATE has been apparent for some time, and it is now possible to arrange for such a course of study to accommodate the Coastal Area by writing to Mrs A. C. Pickard, Official Amaryllis Judging Instructor, 1702 N. Blvd., Houston 6, Texas.

43RD INTERNATIONAL FLOWER SHOW, 1960

The 43rd International Flower Show was held in New York City, March 5 to 12, 1960. The theme of the show was "Flowers of the World." The show was held in the New York Coliseum, Columbus Circle (Broadway & 8th Ave., at 58th Street).

The members of the American Amaryllis Society will be interested to know that "Class 305. Amaryllis, one pot; Class 601. Amaryllis, one specimen; Class 602. Amaryllis, 6 plants, one bulb in a pot" and various classes for *Narcissus*, were provided in the field of the amaryllids.

The show was sponsored by the Horticultural Society of New York, and the New York Florists' Club—office: Suite 212, Essex House, 157th W. 58th Street, New York 19, N. Y.

AMARYLLIS JUDGES CERTIFICATES

Since the last report in the 1959 AMARYLLIS YEAR BOOK (page 24), the following AMARYLLIS JUDGE'S CERTIFICATES have been issued by the AMERICAN AMARYLLIS SOCIETY:

65. Mrs. Bertha B. Manley, Box 608, Tonkawa, Oklahoma.
66. Mr. Timothy A. Calamari, Jr., 1623 Pauger St., New Orleans, Louisiana.
67. Mr. W. D. Morton, Jr., 3114 State Street Drive, New Orleans 25, Louisiana.
68. Mr. H. E. McCarn, 916 Pace Parkway, Mobile, Alabama.
69. Mr. Robert E. Parker, 3051 Baronne Street, Mobile, Alabama.
70. Mr. Louis C. Costa, 356 McMillan Ave., Mobile, Alabama.
71. Mrs. Ruth Costa, 356 McMillan Ave., Mobile, Alabama.
72. Mrs. J. A. Brown, Jr., 700 Fulton Road, Mobile, Alabama.
73. Mrs. Frank Petry, 9 West Petain Street, Prichard, Alabama.
74. Mr. Ivan A. Owen, 2580 Pollard Lane, Mobile, Alabama.
75. Mr. M. R. Bond, Sr., 115 East Sherwood Drive, Mobile, Alabama.

76. Mr. J. A. Brown, Jr., 700 Fulton Road, Mobile, Alabama.
77. Mrs. H. P. Kilpatrick, 279 Park Terrace, Mobile, Alabama.
78. Miss Elizabeth Kilpatrick, 279 Park Terrace, Mobile, Alabama.
79. Mrs. W. P. Bain, 121 Mohawk Street, Mobile, Alabama.
80. Mr. W. P. Bain, 121 Mohawk Street, Mobile, Alabama.
81. Mrs. Earl Parker, 2552 Moffat Road, Mobile, Alabama.
82. Nell Keown, 2060 Pratt Drive, Mobile, Alabama.
83. Lois Koontz, 4200 Overlook Road, Mobile, Alabama.
84. Mr. W. C. Strain, 563 Mohawk Street, Mobile, Alabama.
85. Mrs. Henrietta R. Taylor, 11222 Green Bay Drive, Houston, Texas.
86. Mrs. W. C. Strain, 563 Mohawk Street, Mobile, Alabama.

EDITOR'S MAIL BAG

Under date of Sept. 9, 1959, Mr. L. S. Hannibal, 4008 Villa Court, Fair Oaks, Calif., writes that "visitors here at Fair Oaks will be given their selection of garden run material (free), should they drop in during the flowering season over the Labor Day holiday period [in 1960 and thereafter]. However, I am not interested in distributing bulbs by mail. Too much fuss."

Mulford B. Foster and Racine Foster announced that they are closing their business in the City of Orlando, Florida, as of Sept. 1, 1959, and that their address is now Route 3, Box 658, Orlando, Florida, their new estate at BROMEL-LA, where they find isolation and a private life. They are in "the process of retirement and thus will be open, mainly, for wholesale bromeliads, *by appointment only*, on two days of the week -Tuesdays and Wednesdays. In other words, we need a great deal of time to ourselves in order to catch up with our unfinished paintings, articles and books, as well as further bromeliad research. Out-of-town visitors will be given special dispensation on other days of the week by appointment." The telephone is CYpress 3-4616 (as listed in the Orlando directory).

The writer had a most interesting visit in La Jolla with Prof. Leo Brewer, 15 Vista del Orinda Road, Orinda, Calif. Prof. Brewer is a scientist and is now writing a book on his specialty; he is also a real gardener who is interested in the amaryllids and other plants.

Mrs. Ida Ford Deans writes that her mother, Mrs. J. B. Ford, 119 E. 4th. Ave., Petal, Mississippi, a member of the Society, is very much interested in *Amaryllis* although past 93 years of age (born May 4, 1866); and that she "is actively engaged in growing them, both from seeds and bulbs." Mrs. Deans asks if there is an older member of the AMERICAN AMARYLLIS SOCIETY?

Mr. P. Gordon McNeil, P. O. Ofcolaco, N. Transvaal, South Africa, writes that he grows a particularly fine form of *Cyrtanthus sanguineus* which he obtained from the late Miss K. C. Stanford. He has been

[**EDITOR'S MAIL BAG,** continued on page 22.]

2. SPECIOLOGY

[EVOLUTION, DESCRIPTION, CLASSIFICATION AND PHYLOGENY]

THREE **AMARYLLIS** FROM SABA ISLAND

FRED B. JONES
521 Vaky St., Corpus Christi, Texas

In the fall of 1954, I received from Saba Island, a tiny Dutch possession lying southeast of Puerto Rico, two small shipments of *Amaryllis* bulbs which had been grown under cultivation there. It was through the courtesy of Mrs. Edith Strout, then Chairman of the General

Fig. 6. *Amaryllis belladonna* L., hybrid from Saba Island. Note the stripe on the segs in the throat and the trifid stigma. It may be a cross of *A. belladonna* L. with *A. striata* Lam., since the stigma in *A. belladonna* L. is capitate (minutely trifid).

Amaryllid Committee of the American Amaryllis Society, that I was able to acquire these bulbs. She had made the acquaintance of the lady who dug and sent them while visiting there in the nineteen thirties.

Planted out in a well-prepared bed with afternoon shade, a few of the bulbs sent up scapes the next spring, but most did not bloom until March and April of 1956. Those which flowered were of three kinds. As anyone who has received bulbs under these circumstances well knows, an accurate identification is practically impossible unless the material turns out to be identical in every way with varieties or species already known. In this case, the plants differed considerably from any with which I was familiar. Mrs. Strout had previously grown and flowered

what were probably the same Saba plants and had likewise found it impossible to make a positive identification. It is the plants themselves, however, standing on their own merits as garden material, with which we are concerned here, and final decisions on their proper classification can wait until a later date. The names given below are intended only to suggest the likely affinities of the bulbs. One or more than one may represent true species or all may be hybrids.

Amaryllis belladonna L., species or hybrid (Fig. 6). Blooming in March, this produces usually four brick-red flowers on a stout scape. The greenish-yellow markings in the throat are unlike those found in *Amaryllis belladonna* var. *major*. A really choice bulb.

Fig. 7. *Amaryllis reginae* L., hybrid from Saba Island. Note that stigma is deeply trifid. The stigma in *A. reginae* L. is capitate (minutely trifid).

Amaryllis reginae L., species or hybrid (Fig. 7). Differing in form from the above, the flowers are about four inches across, the outer part of each tepalseg being cherry red, the inner white or greenish white. The scapes are relatively short as are also the pedicels. It blooms in March, slightly later than the above. Truly a gem.

Amaryllis vittata L'Hérit., species or hybrid (Fig. 8). The tall scapes, which appear later than either of the above (in April) are topped by white (not snowy-white) deep-throated flowers having faint crimson lines on the tepalsegs as can be seen in the close-up. On the whole, a less attractive variety than the others.

It will be interesting to see if one or more of these Saba Island plants can be permanently established as garden plants on the Texas coast. Judging from the experience of Mrs. Strout, who tried them in pots in her cool California climate, they will have to be grown in outside beds (personal communication). But further experiments with growing them in containers would be worth while. It is likely that they would resent being dug and stored each winter as is the practice with modern

Fig. 8. *Amaryllis vittata* L'Hérit. (species of hybrid). This may prove to be a variety of this species with lighter crimson lines instead of the more prominent markings in the type.

Amaryllis hybrids in some parts of the country. From my own experience with these bulbs to date (1958), it appears that they are no more particular about the soils in which they are grown than other commonly cultivated species or hybrids. The real limitation seems to be the low temperatures which may be expected during the winter months. These plants were not subjected to such conditions when grown on Saba Island.

NEW BOLIVIAN AMARYLLIS

M. Cardenas, *Bolivia*

During the past five years the writer has searched for *Amaryllis* L. species in various parts of Bolivia. Of the many plants that came to his attention two are new to science and these are described below.

Fig. 9. *Amaryllis fragrantissima* Cárdenas, *sp. nov.*, native to Bolivia; pure white and delightfully fragrant.

Amaryllis fragrantissima Cardenas, **sp. nov.**

Ceophyta 30-40 cm. alta. Bulbo 8-10 cm. long., 6-8 cm. crasso. Tunica exteriore brunea. Fallis in anthesi abscens. Scapo 30-40 cm long., 1.52 cm. a basim crasso, glauco. Bracteis lanceolatis atro purpureis 8 cm long., 1.5 cm. in base latis. Umbella 2 flora. Pedicellis 2.5-4 cm. long., 6-8 mm. crassis. Ovario 12 mm. long. arto viride. Tubo tepalorum 4-6 cm. long., 8 mm crasso supra ovarium. Setepal egmentis 16-18 cm. long., 3-4 cm. latis. Petepalsegmentis parce angustioribus. Omnibus segmentis inferne viridibus, superne niveis, fragrantibus. Staminibus inferne tubo adnatis usque 6 cm. supra ovarium, albis. Antheris 1 cm. long, atro viride. Tubo tepalorum 4-6 cm. long., 8 mm crasso supra ovarium. stamina superante. Stigma trifida, lobis 5 mm. long. deflexa.

Geophytic plant, 30-40 cm. tall, leafless at anthesis. Bulb large, 8-10 cm. long, 6-8 cm. broad. Scape 30-40 cm. long, 1.5-2 cm. thick at the base, glaucous. Spathe valves lanceolate, dark purple, 8 cm. long, 1.5 cm. wide at the base. Umbel (in three plants observed) 2-flowered. Pedicels 2.5-4 cm. long, 6-8 mm. thick. Ovary 12 mm. long, dark green. Tepaltube 4-6 cm. long, 8 mm. thick above ovary. Setepalsegs 16-18 cm. long, 3-4 cm. wide. Petepalsegs slightly narrower. All segments green-

ish below, pure white above, scented. Stamens inserted in the tepaltube. Free portion of stamens 9.5 cm. long, 2 mm. thick, pure white. Anthers about 1 cm. long, 2 mm. wide at anthesis, light yellow. Style free from the bottom of the tube, 15 cm. long, 2.5 mm. thick, white, slightly longer than stamens. Stigma trifid with deflexed 5 mm. long lobes.

Bolivia: Province of Chapare, Yungas of Corani, 1800 m. September 1959, M. Cárdenas No. 5512 (holotype) in Herbarium Cardenasianum.

Obs.—This new *Amaryllis* species was obtained by the writer under cultivation at Cochabamba. The grower had brought it back from Yungas of Corani, which is 3 days journey by foot-path beyond Colomi. It is one of the finest *Amaryllis* species known from Bolivia, having pure

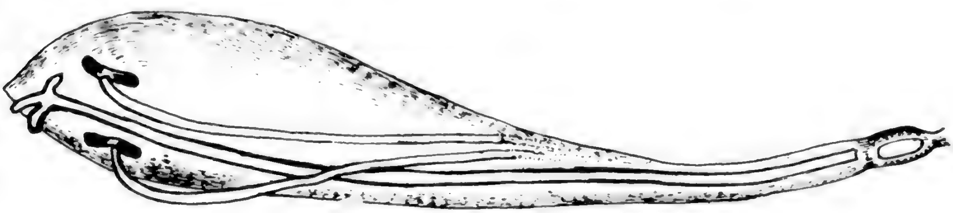

Fig. 10. *Amaryllis fragrantissima Cárdenas, sp. nov.,* showing ovary; place of stamen attachment at the apex of the tepaltube; and tepalseg above tepaltube; length of style; and trifid stigma. Approx. 2/3 natural size.

white, delightfully scented flowers. At first the writer thought that it might be close to *Amaryllis immaculata* Traub & Uphof, but our plant has a shorter tepaltube and only 2 flowers in the umbel as far as known. It is related to *Amaryllis vittata* L'Hérit., from which it differs by its narrower lower section of the flowers, and in the color.

Amaryllis elegans var. **divifrancisci** Cardenas, **var. nov.**

Geophyta 60-80 cm. alta. Bulbo ovoideo 8 cm. long., 6 cm. crasso, tunica exteriore paulisper fusca. Pseudocollo 10 cm. long., 2.5-3 cm. crasso parum complanato. Foliis 5-8, erectis 30-50 cm. long., 2.5-3 cm. latis pallide viridibus linearibus gladiatis, apice parce acuto, margine albescente vel rubescente. Scapo 50 cm. long. superne viride, inferne purpureo. Umbella 2-3-4 flora. Bracteis membranosis 8 cm. long., diluto bruneis. Pedicellis 4-5 cm. long. Tubo tepalorum 10 cm. long., 8 mm. crasso temperato viride. Perigonio 10 cm. long., cremae viridiscentis. Paraperigonio glabro. Segmentis tepalorum 10 cm. long., 2.5-3 cm. latis, lanceolatis. Filamentis adnatis basim segmentorum, subulatis, inferioribus viridibus, superioribus albidis. Stylo stamina 1 cm superante, inferne viride, superne albido. Stigmate trifido. Fructibus 3-4 cm. latis, 1-2 cm. altis, capsula trilocularis dilute fusca et rubida. Seminibus compressis obscure bruneis vel nigris 1-1.5 cm. diam., membranaceis.

Geophytic plant 60-80 cm. tall. Bulbs ovoid about 8 cm. long, 6 cm. broad, bulb-coats thin light brown. Neck 10 cm. long, 2.5-3 cm. thick terete or slightly flattened. Leaves at anthesis 5-8, erect light green 30-50 cm. long, 2.5-3 cm. wide, with whitish translucent margins, linear-lanceolate, slightly acute at apex. Scape about 50 cm. long, 2 cm. thick at the base. Spathe valves 8 x 2.5 cm., light brown, greenish at base, lanceolate. Flowers 2-3-4 in each umbel. Pedicels 4.5 cm. long, 8 mm.

Fig. 11. *Amaryllis elegans* var. *divifrancisci* Cárdenas, *var. nov.*, native to Bolivia; tepaltube light green, rarely tinged purple, tepalsegs creamy-whitish keeled green.

thick, dark green. Ovary 2 cm. long. Tepaltube about 10 cm. long, 8 mm. thick, light green, seldom purple tinged. Tepalsegs much alike, 10 cm. long from the end of the tube. Setepalsegs lanceolate, 10 cm. long, 2.5-3 cm. wide, light green at base, cream whitish at the apex with a green central rib outside. Petepalsegs quite as long as setepalsegs, narrower (2 cm. wide), acute, not mucronate as are the setepalsegs. All tepalsegs deflexed with curled edges. Stamens with the filaments adnate to the tube in its lower part, green below, whitish above, shorter than style, 6 cm. long in the free section. Style green below, whitish above. Stigma clearly trifid with three white round lobes. Paraperigone glabrous. Fruit trilocular, 3-4 cm. broad, 1.5-2 cm. high, light brown, reddish when shedding. Seeds in 2 rows inside each locule, more than 100 in number, circular, membranaceous, 1-1.5 cm. wide, dark brown to black. Locules with reddish interior walls after shedding.

Bolivia: Province of Velasco, Department of Santa Cruz, San Ignacio, 400 m., October 1958, M. Cárdenas No. 5508 (holotype) in Herbarium Cardenasianum. From the type locality near Ignacio, in savanna formation, in all directions, limits undetermined.

Obs.—This showy-flowered *Amaryllis* was sent to us in 1957 from San Ignacio de Velasco by Father Lorenzo Hammerschmid and it flowered in Cochabamba in 1958. In October 1958 we collected it over a wide area in company with Prof. Ira S. Nelson on the way to San Ignacio to San Miguel, and on the way from San Ignacio to Las Lajas. Later on Prof. Nelson collected it again at San Xavier and at Santiago de Chiquitos.

This plant is considered here as a variety of *Amaryllis elegans*, and differs from *A. elegans* var. *elegans* by its longer bulb neck, erect leaves, longer pedicels, more acute tepalsegs, and the clearly trifid stigma. Some plants bear cream-colored flowers suffused purple. No plants among hundreds that have been seen had more than 4 flowers.

HUNTING GREEN-FLOWERED AMARYLLIS IN BOLIVIA

M. Cardenas, *Bolivia*

In August 1902, R. S. Williams, botanist of the New York Botanical Garden while travelling as a member of a British Petroleum and Rubber Expedition in the interior of the Province of Caupolican in Bolivia, discovered a green-flowered *Amaryllis* species near the "Machichoriza" River. In 1910, Dr. Henry H. Rusby, described this plant as a new species under the binominal *Hippeastrum viridiflorus*. No living specimens of the plant were sent to the United States or Europe since that time. We do not know whether the Dutch *Amaryllis* breeders tried to obtain bulbs or seeds in the meantime. Prof. Ira S. Nelson from Southwestern Louisiana Institute while collecting *Amaryllis* material in Bolivia in 1954 and 1958 was determined to go to Apolo in order to locate this long lost plant. On November 1958, when we came back from a journey to Yungas of La Paz, he planned to fly to Apolo by the

beginning of December. Unfortunately, due to a shortage of time and the risk of the rainy season just starting, he could not carry out his plan. Since the beginning of the present year (1959) we have received several inquiries about the location of "Machichoriza" in Bolivia while in the search of the green flowered *Amaryllis*. That name did not appear on any of our maps. We began asking friends in Apolo about this geographical problem. No satisfactory answer was given. Then, looking at the dates and localities given by R. S. Williams during his journey, starting from Apolo and passing on to "Machichoriza," "Guerratuma," Aten and Inglis-Inglis between the end of July and the middle of August in 1902, we guessed at the way to reach the place where this plant might be found. Thus, we started on August 4, 1959 together with two assistants of the Department of Botany, University of Cochabamba, on the way to hunt the green-flowered *Amaryllis*. We reached La Paz by plane and waited until the 8th to fly to Apolo. At Apolo we realized that "Machichoriza" was Manchucuriza and that "Guerratuma" was Huarutumo. On August 11, we left Apolo, located on a grassy meadow at 1,400 m. altitude, for Curiza, an Amerindian settlement located at the lower section of the Rio Curiza. We travelled mostly on foot because the path was rough, having been maintained since the time of Amerindian Cinchona bark and rubber collectors. On the way, we crossed the Altunkama Cuesta at about 2,200 m. Then we descended from the grassy slopes to a deep tropical cañon where the Rio Curiza flows through at 1.100 m. After a whole day's travel we arrived at the Amerindian settlement named Curiza where there were abundant *Amaryllis belladonna* L. plants in full flower. We asked the local Amerindians about the green-flowered *Amaryllis*. They said we had to climb up the mountain to obtain it. On August 12 we traveled from Curiza Mountain up in the direction of Cargadero and found very showy specimens of *Amaryllis pardina* in bloom. These differ from those growing also wild in Yungas of La Paz by the larger and lighter colored flowers. By the way, Pearce, the early *Amaryllis* hunter in the Andes, stated that the "leopard" *Amaryllis* came from Peru. We do not know if anyone has collected wild specimens of it in Peru. After this difficult mountain climbing we came back to Curiza not having seen a single plant of *Amaryllis viridiflora*. The next day we started in the direction of the Rio Huarutumo and arrived at Guanay with the same unfortunate results. The next day, crossing rushing rivers, we reached Aten. From here in one more day's journey, we arrived at Apolo. On the way between Curiza and Aten we passed through large areas of flowering *Amaryllis* into the wet forest. Some of these had giant leaves and scapes, scapes reaching up to 1.5 m. and leaves 10 cm. wide. Here we identified *Amaryllis crociflora* looking much like *A. belladonna* except for its shorter and regular tepaltube. Though we did not find the green-flowered *Amaryllis*, we became acquainted with the native Amerindians on the way down. This was fortunate. Some 15 days after our return to Cochabamba, we received three scapes of the green-flowered *Amaryllis* at long last from the Amerindians of the Rio Curiza, and comparing them with the original Rusby description, we concluded that we had in

hand the so long lost species Later on we received a few plants with bulbs and ripe capsules. These bulbs are growing in our nursery at the University of San Simon. The seeds are being distributed among a few of the American *Amaryllis* growers. We have also sent these to Dr. Hamilton P. Traub and Prof. Ira S. Nelson. The Missouri Botanical Garden has received a good supply of these seeds also. We had reached the type locality, only 15 days too early.

Now, returning to the characters of this long lost plant, we found it closely related to *A. elegans* Sprengel. Probably Dr. Rusby when describing it as a new taxon, did not have our plant in mind. The color of flower is not leaf green as we expected but light lettuce-green or rather "Love bird" or "Calliste" green. In any case, we hope that with our introduction of seeds into the United States, the American *Amaryllis* breeders will be able to use this rare green-flowered *Amaryllis* species in producing large-flowered green hybrids.

AMARYLLID NOTES, 1960

HAMILTON P. TRAUB

ROSENBERG—CORONA AMARYLLIDACEA

This rare book containing 8 color plates was published for the author, Miss Rosenberg, by C. A. Bartlett, Bath. (1839). Folio. Each of the 8 plates is an original water color. It is not listed in Bruner, Lowndes, Pritzel, or Dunthorne, but is listed by Nissen.

NOTHOSCORDUM NERINIFLORUM

Nothoscordum neriniflorum (Herb.) Traub, comb. nov. Syn.—*Caloscordum neriniflorum* Herb., Bot. Reg. Lond. 30: misc. 67. 1844; Lindley, Bot. Reg. Long. 33: pl. 5. 1847, err. *nerinifolium*; *Allium thunbergii* Regel, A. H. P. 3: 234. 1875, non G. Don.

BRUNSVIGIA ROSEA VAR. BLANDA

Brunsvigia rosea var. *blanda* (Kew-Gawl.) Traub, *comb. nov.* Syn. —*Amaryllis blanda* Ker-Gawl., Bot. Mag. Lond. 35: pl. 1450. 1812.

AN INVIDIOUS DISTINCTION

In Article 2, of the International Code of Nomenclature for Cultivated Plants (1958), it is stated that "The International Code of Botanical Nomenclature governs the use of scientific ("Latin") names for both cultivated and wild plants." This implies that names in a modern language authorized in the Code for Cultivated Plants are "not scientific" names. This is an invidious distinction. The taxonomy and nomenclature of plants, including wild (invidiously called botanical) and cultivated plants (which are also a part of botany) are indivisible on the basis of either one being more or less scientific. The names of cultivated plants in a modern language are used in scientific articles on the same basis as the names of wild plants. The taxonomy and nomen-

elature of cultivated plants are aspects of a larger subject, and the names of cultivated plants in a modern language are in fact scientific names. This reminds one of the sign displayed in front of a cinema house stating—

THERE WILL BE **MUSIC** AND **SINGING** INSIDE

This is an invidious distinction, unless one holds the view, not without reason, perhaps, that the modern "*singing*" involved is *noise* and not *music*.

For the reasons indicated, it is proposed, that when the Code for Cultivated Plants is again revised, that then the word "scientific" with reference to names be eliminated in Article 2 and elsewhere in the text (Art. 39, "the scientific or cultivar (variety) names", etc.), and that the word "Latinized" or "latinized" be substituted for it in each case. And that the phrase "in a modern language" be used when referring to non-latinized cultivar names.

TYPE OF DIPHALANGIUM GRAMINIFOLIUM DESTROYED IN WORLD WAR II

Dr. K. H. Rechinger, Naturhistorisches Museum, Wein, in a letter under date of Sept. 30, 1959, writes—"unfortunately the type specimen of *Diphalangium graminifolium* Schauer is not available any more. All our old material of *Diphalangium* and of the closely related genera has been destroyed by war accident [World War II]." Among the list of other specimens destroyed are included all *Liliaceae* and *Amaryllidaceae*.

SPREKELIA FORMOSISSIMA SUPERBA HORT.

The commonly grown group of *Sprekelia* in the United States is known as *S. formosissima superba* Hort. Burbank had claimed that he crossed the smaller-flowered *Sprekelia* with *Amaryllis* and had thus obtained the larger-flowering form. However, attempts to duplicate this cross have uniformly failed and it is clear that what Burbank had was apparently a polyploid form with larger flowers. It was Burbank's habit to grow a great many seedlings and make selections.

Mrs. Morris Clint has recently collected various forms of *Sprekelia* in the wild in Mexico, and also cultivated forms from other *Sprekelia* enthusiasts. One of these larger-flowered forms was described as 'Harrison's Orientred' in the 1959 AMARYLLIS YEAR BOOK, pp. 63-64.

On December 19, 1959, another of Mrs. Clint's collection (Clint-832) flowered at La Jolla. She had obtained this from Sydney Wilderman, San Antonio, Texas. This belongs to the larger-flowered group. The flowers are 17 cm. across the face and orient red (HCC-819) in color, but the whitish-greenish pattern is slightly different. The whitish stripe from the bottom in the upper setseg, and the 2 side petsegs is about half as long as the segs, and these segs are whitish-greenish for a short distance on the upper side at the base. The upper margins of the 2 side setsegs, for about 2/3 their lengths, are whitish-greenish, and this coloration widens near the base. The base of the stamens is whitish-

[**AMARYLLID NOTES, 1960,** continued on page 17.]

CATALOG OF **BRUNSVIGIA** CULTIVARS

HAMILTON P. TRAUB AND L. S. HANNIBAL

The hybridization of brunsvigias started in the 40's of the 19th century in Australia and this interest in the group has continued there to the present day. Later in the 19th century breeding interest in this group is noted also in New Zealand and Europe. In the 30's of the 20th century, interest in the breeding of these fine plants was awakened in the United States as a result of the founding of The American Amaryllis Society, particularly through the efforts of the late E. O. Orpet of Santa Barbara, California, who imported the fine Australian hybrids. With the naming of various cultivated hybrid clones in Australia, Europe and the United States it becomes necessary to straighten out the confused nomenclature.

The objective of the present catalog is to take up the names in the literature and thus provide a checklist for those who name *Brunsvigia* cultivars in the future. This will serve to avoid duplication of names. Thus, this catalog of *Brunsvigia* cultivars, including also the species with their synonymy for the convenience of breeders, will serve as the starting point in their nomenclature. Future catalog lists will include only the cultivars that are known to be in cultivation in the various parts of the world.

THE INTERNATIONAL CODE OF BOTANICAL NOMENCLATURE (Lanjouw et al, 1956) and THE INTERNATIONAL CODE OF NOMENCLATURE FOR CULTIVATED PLANTS (Fletcher et al, 1958) are followed in this catalog.

In order to avoid duplication of names, it is desirable to register new named clones through the registration service for amaryllids, including *Brunsvigia*, provided since 1934 by THE AMERICAN AMARYLLIS SOCIETY, which is affiliated with THE AMERICAN PLANT LIFE SOCIETY. Registrations are published in the AMARYLLIS YEAR BOOK. Information about the registration of new clones should be addressed to Mr. W. D. Morton, Jr., Registrar, 3114 State Street Drive, New Orleans 25, Louisiana, U. S. A., or to Dr. Thomas W. Whitaker, Executive-Secretary, Box 150, La Jolla, California, U. S. A.

This is one contribution toward a complete CATALOG OF AMARYLLID CULTIVARS, which will list all of the cultivars of the Amaryllis Family *(Amaryllidaceae)*, sponsored by THE AMERICAN AMARYLLIS SOCIETY. Menninger presents another contribution toward this goal—CATALOG OF HYBRID NERINE CLONES—in the present issue of the AMARYLLIS YEAR BOOK.

BREEDING PRINCIPLES

As a basis for an understanding of the results achieved by the pioneer brunsvigia breeders, it is desirable to consider the genetic principles involved which were not understood in the earlier years before 1900.

As far as known at present, the genus *Brunsvigia* is characterized by a basic chromosome number of $x=11$, and a somatic number of $2n=22$

(Inaryama, 1937; Sato, 1938; Traub & Moldenke, 1949; Gouws, 1949; Traub, 1958). Polyploid species in this genus have not been reported to date. Thus, in this genus, any changes observed in the hybrids are apparently not due in part to an increase in chromosome number

Fig. 12. *Brunsvigia grandiflora* Lindl. (received as *B. slateriana* (Herb.) Benth. & Hook.), as grown in an 8″ pot by L. S. Hannibal in central California. The umbel is 12″ in diameter. Photo by L. S. Hannibal.

(polyploidy), but the marked changes noted are to be attributed to other possible causes such as gene mutations and recombination of genes in the hybrid individuals, including the special case of heterosis commonly called hybrid vigor.

When *Brunsvigia* species were first hybridized in Australia over a century ago, and Europe in the 1890's, one of the first changes noted was an increase in the size of the flowers in some of the progeny; also rapid increase by offsets was noted (Van Tubergen, 1909). It is now known that this phenomenon is due to heterosis or hybrid vigor (Traub, 1958). This is due to bringing together by recombination in certain individuals of the more favorable genes (see Fig. 17). Such large-flowering individuals were selected and used in further breeding on a new flower size level.

Fig. 13. Leaves of a hybrid *Brunsvigia* reported as widely grown in Australia and New Zealand under the name "Brunsvigia josephinae". Two bulbs shown above with 7 offsets in three years; grown by L. S. Hannibal in central California. Photo by L. S. Hannibal. See Fig. 14 for flowers.

The cultivation of *Brunsvigia* species or any other species does not increase the gene mutation rate under ordinary conditions, but it does provide a means of preserving any such mutations, considered of value by the breeder, that do occur which might have been promptly eliminated by natural selection in the wild. Some of such marked changes in flower shape (see Fig. 17) apparently are conditioned by dominant, others by recessive, genes. The new dominant genes apparently have arisen by mutation under cultivation; the recessive genes such as suddenly manifest themselves when present in double dose, may or may not have been present in the original population.

Thus, the genes contributed by the original parent species plus any spontaneous gene mutations under cultivation, made possible further improvement by recombination of the genes in the many generations after the first crosses. Still further improvement on new levels is possible by bringing in new genes by crossing the hybrids with other *Brunsvigia* species not previously used.

ADDITIONAL BREEDING MATERIAL NEEDED

It is clear therefore that in addition to the species apparently used so far in *Brunsvigia* breeding—*B. rosea, B. grandiflora, B. josephinae,*

Fig. 14. Floral umbel of a hybrid *Brunsvigia* reported as widely grown in Australia and New Zealand under the name "Brunsvigia josephinae". Note that the general shape of the flowers is similar to those of *B. josephinae* but the curved trumpet is longer, and that the flowers are much larger. This may be a segregate in the direction of *B. josephinae* from a cross made in the past. Photo by R. E. Harrison, New Zealand. See Fig. 13 for leaves, which also show hybrid vigor.

B. appendiculata and *B. orientalis*—additional material is needed from the summer and winter rainfall regions of South Africa.

FOR SUMMER RAINFALL AREAS. It should be noted that up to the present, the breeding of brunsvigias has been based on the species that happened to be available—which apparently came from the winter rainfall areas of South Africa. Thus it happened that the hybrids obtained thrive only in the southwestern United States which have winter rainfall. All attempts to grow these species and their hybrids in the open in the Southeastern United States have uniformly failed. Some few have reported limited success when the hybrids are grown in

tubs and the bulbs are kept dry in summer and are watered for growth in winter, but this type of culture is not popular.

It has been pointed out (Dyer, 1950; 1951) that some of the species grow either in the summer rainfall areas of the Transvaal and Natal, or range from the winter rainfall areas into the summer rainfall areas. These species include *Brunsvigia natalensis*, from Natal; *B.* sp. unnamed (Dyer 1950, Plate 12), from the Transvaal; *B. radulosa*, ranging from the Orange Free State into Transvaal and Natal; *B. grandiflora*, ranging from Cape Province into Natal; and *B. undulata*, from Natal. The races of these species adapted to the summer rainfall climate from the Transvaal and Natal should be collected for use by the breeder. By making the appropriate crosses of these races with *Brunsvigia rosea* and available hybrids, large-flowering segregates in the second and later generations could possibly be obtained that are also adapted to the southeastern United States with a similar summer rainfall climate. At least, this additional breeding work is worthy of a trial. It is hoped that our South African friends will be able to supply this needed breeding material.

COLOR VARIATIONS.—In addition to breeding hybrids adapted to the rainfall areas it is desirable to give attention to an increase in hybrid flower color forms. These can best be obtained by using the various species as parent material. Table 1, indicating the number of flowers per umbel, the flower color, and fragrance, is presented for those interested in such a project.

TABLE 1. Flowers per umbel, flower color and fragrance in **Brunsvigia.**

Species	Flowers per umbel	Flower color and fragrance
***Brunsvigia rosea**	(4)-5-18-flowered	rose-red, with lighter and deeper colored forms; **fragrant**
Brunsvigia marginata	10-20-flowered	bright scarlet
Brunsvigia radula	3-5-flowered	flesh pink
Brunsvigia comptonii	6-13-flowered	pale to dark pink
Brunsvigia bosmaniae	about 20-flowered	shell pink with darker veining to almost white; **fragrant**
****Brunsvigia appendiculata**	20-75-flowered	deep pink
Brunsvigia minor	12-flowered	rose-colored, or rose, whitish within
Brunsvigia striata	about 20-flowered	red to rose
Brunsvigia gregaria	30-50-flowered	pink to crimson
Brunsvigia natalensis	30-60-flowered	deep pink
Brunsvigia radulosa	30-60-flowered	red or pink
***Brunsvigia orientalis**	20-40-flowered	bright red or pink
***Brunsvigia grandiflora**	about 30-flowered	light to dark pink, or bright red
Brunsvigia undulata	35-80-flowered	claret-colored
***Brunsvigia josephinae**	20-60-flowered	red with dull yellowish-orange on outer surface towards the tepaltube
Brunsvigia litoralis	14-40-flowered	deep red with small crystal-like yellow flecking

* Reported as used in the breeding hybrid Brunsvigias.
** Used by Hannibal, but so far no seeds have been obtained.

FOR WINTER RAINFALL AREAS. In addition species should be collected in the winter rainfall areas of South Africa to bring in new characters into the hybrids for the winter rainfall areas of the United States. These species include *Brunsvigia radula*, *B. camptonii*, *B. bosmaniae*, *B. appendiculata*, *B. minor*, *B. striata*, *B. gregaria*, *B. radulosa*, *B. orientalis*, *B. grandiflora*, *B. josephinae*, *B. litoralis*, *B.* sp. (Dyer, 1951, p. 64) and *B. marginata*.

HISTORICAL REVIEW

Although there are two other references to *Brunsvigia* hybrids in the literature—Maund's Floral Register, 1st ed. p. 111, plate 879; and Herbert, Amaryll., 1837—there is no record of the parentage of the first and its fate; and no record that the second ever flowered. Thus the breeding of *Brunsvigia* hybrids, on the basis of practical results, begins with John Carne Bidwell (1815-1853), the Director of the Sydney Botanical Garden, 1843-1853.

BRUNSVIGIA PARKERI

BRUNSVIGIA x PARKERI Australian group.—J. C. Bidwell reported in Gardeners' Chronicle, July 29, 1850, page 470, that in 1841 he crossed "Brunsvigia multiflora" [=*grandiflora* Lindl.] with *Brunsvigia rosea* (Lam.) Hann., and he also crossed *Brunsvigia josephinae* with *Brunsvigia rosea* (Lam.) Hann. Unfortunately he described the progeny from both crosses as one group as follows:

"In February 1841 I raised a vast number of seedlings from [The Cape] Belladonna [=*Brunsvigia rosea* (Lam.) Hann.] by *B[runsvigia] multiflora* [=*Brunsvigia grandiflora* Lindl.] Seedlings flowered in six years and are extremely beautiful. Their colour is generally like that of *Passiflora kermesina*, but it varies in different specimens, and many are blotched with white. There are from twenty to forty flowers on a scape. The shape varies greatly, the crosses by *B[runsvigia] multiflora* [=*Brunsvigia grandiflora* Lindl.] being generally wider in the segments than the others, and of a better figure, shorter and more ringent. The germen [ovary] does not seem to contain any ovules, and the anthers are without pollen. Leaves varying in width from 1 inch to 4 inches, but always glaucous. . . . In 1847 I saw a pot containing about 300 seeds of *B[runsvigia] multiflora* [=*Brunsvigia grandiflora* Lindl.] x *A. Belladonna* [=*Brunsvigia rosea* (Lam.) Hann.] but not more than thirty of them germinated. I believe the bulbs are still living [1850]." [In the above quotation, the names of the probable parents and explanatory additions are inclosed in brackets.]

Bidwell apparently was in error in stating that the ovary "does not seem to contain any ovules, and the anthers are without pollen" since later workers have made abundant crossings among the Bidwell hybrid progeny. In fact, there are populations of hybrids based wholly or in part on the Bidwell hybrids in various parts of the world as will be shown below.

The tentative identification of the *Brunsvigia* parents used by Bidwell in the 1840's [as indicated in brackets in the quotation above] presents many difficulties at this late date.

Aiton proposed the name *Brunsvigia multiflora* Ait. in 1811 for the plant that is now known as *Brunsvigia orientalis* (L.) Eckl. (1827). This plant was pictured under the name "Brunsvigia multiflora" by Ker-Gawler in 1814 (Bot. Mag. Lond. vol. 39, plate 1619), and was described by Herbert in 1837 under the name "Brunsvigia multiflora Heister". He also gave a figure of the capsule and sprouting seedling. It is known that Bidwell was in communication with Herbert, and apparently had access to Botanical Magazine (London), and Herbert's Amaryllidaceae (1837). The Sydney Botanical Garden plant catalogue of 1857, as shown by a photostat from the Lindley Library lists "Brunsvigia multiflora Heir." The author's name "Heir." is apparently an abbreviation ["Hei . . . r"] for "Hiester". This apparently explains the source of the *name* "Brunsvigia multiflora" that Bidwell used. However, the *plant* that Bidwell used in his cross appears to have been a form of *Brunsvigia grandiflora* Lindl. (Fig. 12) on the basis of recent experimental evidence. This conclusion is based on the fact that recently Hannibal (1957) has shown that segregates in the direction of *B. grandiflora* Lindl. have been obtained among his breeding progeny based on available descendants of the Bidwell hybrids. This would indicate that Bidwell most likely used a form of *B. grandiflora* Lindl., which he erroneously listed as "Brunsvigia multiflora" in 1850 when he reported his original crosses. This species could have been introduced from the summer rainfall area of South Africa, and such a form and its hybrids would be conditioned for culture in Australia.

With reference to the form of *Brunsvigia josephinae* that Bidwell used, it should be realized that this species (from the winter rainfall area of South Africa) is difficult to maintain under summer rainfall conditions. Thus the genes conditioning for climatic compatibility in the hybrids would weaken them as far as adaptability to culture in Australia is concerned. However, some of the *B. josephinae* genes, such as those expressed in floral characters in the hybrids, in the absence of dominant genes for winter rainfall climatic adaptability, could possibly be retained in the progeny that possess mostly *B. grandiflora* and *B. rosea* genes without loss in adaptability to Australian growing conditions. This, however, is a problem that needs further study and should be considered in connection with the other problem posed by the *Brunsvigia* hybrid shown in Figs. 13 and 14.

As to the form or forms of the Cape Belladonna, *Brunsvigia rosea*, used by Bidwell in his original crosses, this represents a problem that has not been solved.

Recently, Harrison's Nursery, in New Zealand, has offered a plant under the name, "Brunsvigia josephinae". This is reported as widely grown in Australia and New Zealand and is believed by some to represent one of the parents used by Bidwell in his crosses. An inspection of Figs. 13 and 14 shows that the plant has very long narrowly oblanceolate-lorate leaves which differ markedly from the oblong leaves of

B. litoralis that are only up to 20 cm. long. The shape of the flowers is similar to those of *B. josephinae* but they are very much larger and

Fig. 15. An early illustration of the Australian *Brunsvigia* hybrids that appeared in The Horticultural Magazine of New South Wales in 1866. On the basis of priority of names these hybrids are now recognized as *Brunsvigia* x *parkeri* Australian Group. Photo courtesy The Bulb Society.

in this respect they are similar to those of *Brunsvigia* x *tubergenii* (Tubergen, 1909). This hybrid or a segregate from earlier hybrids (Figs. 13 & 14) apparently shows an intermediate stage between

B. josephinae and *B. rosea*. This hypothesis, however, has to be tested further, and under the circumstances, a more detailed study of the plant is required for a later report.

Bidwell died at the early age of 38 years, only 3 years after he published his report in 1850. Thus the development of his hybrids—which are his lasting monument—was presented as a challenge to other Australian breeders.

The later history of the Australian hybrids is becoming better known due to the researches of Cowlishaw, Hannibal and others. Bidwell apparently distributed his hybrids to his friends and these plants were usually known as *Brunsvigia* x *multiflora* Hort., hybrids, including *alba*, *pallida* and *rosca* forms. Other names were also used.

The earliest known illustration of these hybrids is shown in Fig. 15, reproduced from the Horticultural Magazine of New South Wales of 1866, and which appeared only 13 years after Bidwell's death. This should be representative of the better early results achieved by Bidwell's followers in Australia. It apparently points to the preponderance of *Brunsvigia grandiflora* (see Fig. 12) and/or *B.* x *josephinae* genes in the plant pictured in Fig. 15 that condition the smaller flowers and their shape. This is made clearer when compared with the selected clones of the present day breeders (see Figs. 16 and 17).

If allowance is made for hybrid vigor, the relatively larger imbricated flowers shown in Fig. 16, and in part of the flowers in Fig. 17, apparently indicates the preponderance of *B. rosea* genes (see *B. rosea* var. *rosea bicolor* Hort., in Fig. 17) in the plants that produced them. The flowers with narrow tepalsegs shown in Fig. 17 are apparently conditioned in part by *B. grandiflora* genes in the plants that produced them, if due allowance is made for any gene mutations that are expressed as irregular tepalsegs.

The nursery firm of John Baptist & Sons was the first to distribute the Bidwell hybrids commercially in Australia. Later workers with these hybrids include Henry Selkirk, Messrs. Holloway, Bradley, and Cowlishaw (1935; 1955) who is active to the present day. In Australia, according to Cowlishaw (1955), the "stock remained fairly true to type for more than 50 years while under the hands of the Baptists. Then Holloway (who introduced the fine clones 'Harboard' and 'Ovieto') mass produced seeds for the trade about 1910, and Bradley introduced his hybrid 'Hathor' in 1911. Finally the "Parkeri" bulbs were reintroduced from England. These latter were the Kew type seedlings of the original "Parkeri" . . .". Cowlishaw (1935; 1955) himself has made important contributions toward the development of these hybrids. He introduced the fine clone 'Alabaster' and others.

It is now in order to consider the further development of these hybrids in various parts of the world. But before proceeding with this, it is necessary to consider the inheritance of the tubular basal leaf-sheath (sometimes called a pseudo-neck) in the hybrids.

Cowlishaw (1955) cites the results obtained by Selkirk when Bidwell hybrids were crossed with *blanda*. Such crosses resemble the Bid-

well hybrids, and "in this instance the leafy stem is most pronounced. A vigorous leaf growth usually accompanies these plants, having a lengthy pseudo-stem. The flowers vary from good whites to rose pinks and are all reflexed."

TUBULAR BASAL LEAF-SHEATH.—In order to put this matter on a factual basis, the present writers have taken actual measurements of the characters concerned and these are recorded in Table 2.

TABLE 2. Deciduous basal distichous (opposite) bracts and deciduous basal tubular leaf-sheaths (the latter sometimes erroneously called "pseudo-stems") in the Cape Belladonna and its hybrids.

B. orientalis, B. grandiflora, B. appendiculata, and **B. radula** included for comparison. Measurements made as of January 15, 1960.

Species, variety or form	Deciduous basal distichous (opposite) bracts,[1] length, cm.	Deciduous basal tubular leaf-sheath,[2] length, cm.
Brunsvigia orientalis [5]	none	none
Brunsvigia grandiflora [6]	none	none
Brunsvigia radula [6]	none	2
Brunsvigia appendiculata [6]	none	none
Brunsvigia rosea var. **rosea**		
(a) naturalized in Colombia [5]	none	2.2
(b) from Table Mountain, S. Afr.		
Stanford No. 1.[5]	2.2—3.0 [3]	1.1 [3]
Stanford No. 2.[5]	1.4—2.8	none
Brunsvigia rosea var. **major**		
(a) from garden, Santa Cruz, Bolivia [5]	none	1.5
(b) cultivated, local, California [5]	none	0.4—1.4
Brunsvigia rosea x **purposea** Hort. Received as **B.** x **purposea** Hort.[5]	none	2.0—2.2
Brunsvigia rosea x **rubra** Hort. Received as **B. rosea** x **rubra** Hort.[5]	none	2.2—2.5
Brunsvigia x **parkeri** Australian group		
(a) received as **B.** x **baptistii** Hort.[5]	1.5—2.2 [3]	0.5 [3]
(b) received as **B.** x **multiflora alba** Hort.[5]	none	2.6
(c) received as **B.** x **multiflora** Hort.[5]	1.2—2.3 [4]	1.0—1.4 [4]
(d) clone 'Clarke's Glory' [5]	none	10.2—11
(e) clone 'Hathor' (Bradley, 1911)[5]	none	2.1—3.8
Brunsvigia x **parkeri** Zwanenburg group		
(a) close 'Lydenburg' (Van Tubergen)[5]	none	1.6—2.7
(b) close 'Jagersfontein' (Van Tubergen)[5]	none	3.0—3.8
Brunsvigia x **parkeri** English group Received as **B. x parkeri** [5]	1.6—2.5 [3]	1.7—2.8 [3]
Brunsvigia x **parkeri** American group Clone 'Peaches & Cream' (Hannibal)[5]	none	2.6—4.1

1 When no recognizable basal tubular leaf-sheath is noticeable, there are two opposite deciduous bracts, one is slightly shorter than the one on the other side.

2 The basal sheaths below the first full leaf may have free lobes of varying lengths; these will not be considered here.

3 In some cases of bulbs with offsets in common bulb coats, there are opposite bracts on some sprouts and tubular sheaths on others.

4 These are a group of seedlings; some have basal opposite bracts; others have basal tubular leaf-sheaths.

5 Grown at La Jolla, California.

6 Grown at Fair Oaks, California.

The data in Table 2 show that in *Brunsvigia rosea* and its hybrids, there are two basic types of basal sheaths: (a) deciduous basal distichous (opposite) bracts with apparently no, or practically no tubular portions, and (b) distinct deciduous basal tubular leaf-sheaths. In some cases of bulbs with offsets still held in common bulb coats, there are both of the above mentioned types. When bulbs are partly above ground, the basal tubular leaf-sheaths may sometimes be very short.

The above mentioned types of distichous bracts and tubular leaf-sheaths, should not be confused with the usual dried tunics of the bulb and bulb-neck such as are found in all *Brunsvigia* bulbs. Among the other species studied, only *Brunsvigia radula* has a tubular leaf-sheath (2 cm. long), whereas, *B. orientalis*, *B. grandiflora*, and *B. appendiculata*, have none.

The data in Table 2 show that the length of the tubular leaf-sheath varies from less than 0.5 cm. to the extreme of 11 cm. in length. In the literature it has generally been assumed that the tubular leaf-sheath (called a pseudo-stem, a name that should be abandoned since it is not a stem; and nothing is "pseudo" in nature) was derived from crossing with *Brunsvigia rosea* var. *blanda*. However, it is now known that the original type plate of this variety shows no such tubular leaf-sheath in the drawing of the bulb. The data in Table 2 supply the key to the puzzle. *Almost* all of the entries for *Brunsvigia rosea* var. *rosea*, and all for *B. rosea* var. *major* Hort., show the presence of the tubular sheath with a range from 0.4 to 2.2 cm. in length. When such plants were crossed with other *Brunsvigia* species, the resulting hybrid vigor apparently *extended also* to the tubular leaf-sheaths so that even the extreme length of 11 cm. has been noted in some of the later hybrids. Thus, the special kind of heterosis known as hybrid vigor, the recombination in the individual of the most favorable genes, apparently explains the longer basal tubular leaf-sheaths in the *Brunsvigia* hybrids.

BRUNSVIGIA x PARKERI English group.—Hannibal has recently brought to light further information on the connection of Lady Parker with the Australian group of *Brunsvigia* hybrids, both in Australia and in England.

In Gardeners' Chronicle, Sept. 4, 1875, it is noted that "The Amaryllis (=*Brunsvigia* hybrid) exhibited by Mr. Boivell, gardener to Sir H. W. Parker, at the Royal Horticultural Society on August 18, is a seedling raised by Lady Parker in Australia from a cross between "Amaryllis belladonna" (=*Brunsvigia rosea*, the Cape Belladonna) and *Brunsvigia josephinae*. The cross was first effected by the late Mr. Bidwell, and since has been several times repeated by Lady Parker. Some of the seedlings so raised were superior, both in number and colour of the flowers to the specimen exhibited on the 18th." The reader is referred to the previous section with resepect to the parents used by Bidwell in Australia. Lady Parker apparently was working with the Bidwell hybrids since the English group based on the Parker introductions into England are quite similar to the Australian group.

It should be noted that Sir Henry Parker (1808-1881) sailed to New South Wales in 1838; married Emmeline Emily Macarthur, third daughter of John Macarthur, in 1843; was Premier of N. S. W. 1856-1857 and returned to England in 1858 where he settled at Stawell House, Richmond, Surrey. Sir Henry Parker is not to be confused with Sir Henry Parks (1815-1896) who was Prime Minister of N. S. W. 1872-1891.

Bidwell, the pioneer *Brunsvigia* breeder, was the supervising gardener on the Macarthur estate in Camden Park and lived on the

Fig. 16. *Brunsvigia* x *parkeri* Zwanenburg Group produced by Messrs. Van Tubergen in Holland. Photo by Messrs. Van Tubergen.

grounds. It was here in 1841 that he effected his *Brunsvigia* crosses, and where the first white-flowered segregate appeared in 1860 some seven years after his death.

Thus the English group of hybrids was derived from the Australian group. Among others connected with the development of these hybrids in England were A. Worsley and Messrs. Sander & Co.

BRUNSVIGIA x PARKERI Zwanenburg group. Messrs. Van Tubergen in the Netherlands imported stock of *Brunsvigia x parkeri* (Australian group) and back-crossed these on forms of the Cape Belladonna—*Brunsvigia rosea rubra major* Hort. and *B. rosea purpurea Major* Hort.—and this gave rise to the free-flowering Zwanenburg group (Hoog, 1935; 1947). See Fig. 16. Messrs. Van Tubergen have introduced no less than 20 superior clones, such as 'Cape Town', 'Jagersfontein', 'Kimberley' and so on. These have been flowered in Southern California and they are excellent garden plants in every way.

BRUNSVIGIA x PARKERI American group.—Beginning in the 1930's, stock of the *Brunsvigia* x *parkeri* hybrids was imported into the United States from Australia, England and the Netherlands. The pioneer in this activity was the late E. O. Orpet who imported bulbs from Australia, including the fine white forms. Among others who have imported stock are L. S. Hannibal, Dr. Joseph C. Smith and Hamilton P. Traub. Once this stock was available, it was utilized in further breeding, and the various hybrids were, and are being intercrossed. The result is a distinctive American group (Fig. 17) which is still developing. The leader in this field is L. S. Hannibal (1955; 1957), who since 1940 has introduced no less than 15 named clones, including 'Blaze', 'Purity', 'Picotee', 'Stormy Sunset', and so on. Others who are active in this field are Dr. Joseph C. Smith, Mrs. Polly Anderson (1959), and Hamilton P. Traub. Many seedlings are being raised and thus many superior named clones can be expected to appear in the future in the United States.

NOMENCLATURE OF THE HYBRIDS.—By this time it is clear that all of these hybrids—the Australian, English, Zwanenburg and American groups—belong to one great group which was started in Australia by Bidwell; was, and is being, developed further there and in New Zealand; was exported to England, the Netherlands, and the United States. In each of these areas, further development has, and is, taking place. In accordance with the Botanical Code, it is necessary to adopt the earliest validly published name for this hybrid group. In 1909 (Gard. Chron. Lond., Feb. 6, 1909, p. 90), W. Watson applied the epithet *parkeri* to the English group, and this was recognized by Worsley who made a new combination, x*Brunsdonna* parkeri (W. Watson) Worsley in 1926. At the same time he proposed the name, x*Brunsdonna bidwellii* Worsley for the Australian group. Among other names that have been used in horticulture for the latter group are *Brunsvigia* x *baptistii* Hort., and *B.* x *multiflora* Hort., but these and others were not validly published and need not be considered further. It should be noted that the epithet *parkeri* which dates from 1909, has priority over *bidwellii* which was proposed in 1926. Therefore, the name, *Brunsvigia* x *parkeri* (W. Watson) Traub, (in Plant Life 5: 134. 1948) is the valid name for the entire great group including the Australian, English, Zwanenburg and American groups.

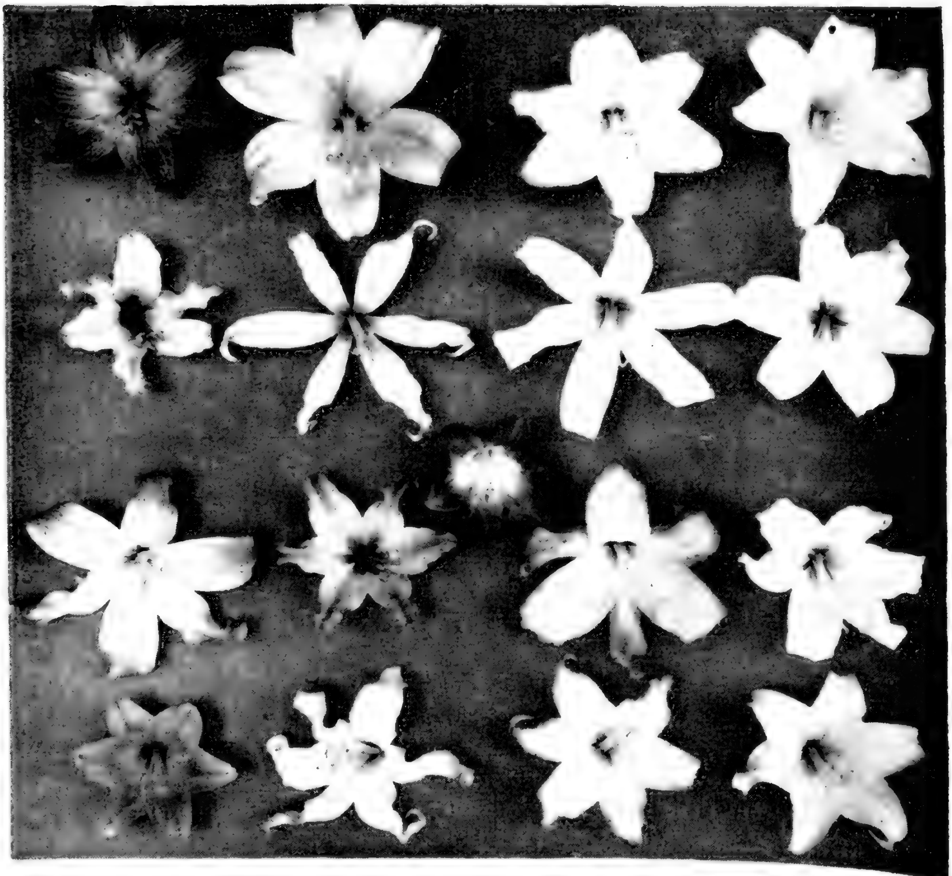

Fig. 17. Floral variation in *Brunsvigia* x *parkeri* American group, including selected Hannibal seedlings and named clones; and with *Brunsvigia rosea* var. *rosea bicolor* Hort. (center of Figure), *B.* x *parkeri alba* Hort. (Australian group), *B.* x *parkeri rosea Hort.* (Australian group), and *B.* x *parkeri* (Australian group) cl. 'Glory' (Allister Clarke), for comparison.

FIRST ROW, top; from left: *B.* x *parkeri* (Australian group) cl. 'Glory' (Allister Clarke), a deep rose-red; *B.* x *parkeri* (American group) cl. 'Pacifica' (Hannibal), a large pale pink; *B.* x *parkeri* (American group), unnamed broad- eged picotee; and *B.* x *parkeri* (American group), unnamed pink seedling.

SECOND ROW, from top; *B.* x *parkeri* (American group), unnamed seedling with outer segs ruffled; *B.* x *parkeri* (American group) cl. 'Spider' (Hannibal), a segregate from the following, *B.* x *parkeri alba* Hort. (Australian group), a form with linear segs [derived from *B.* x *parkeri* (Australian group) cl. 'Hathor' (Bradley, 1911]; *B.* x *parkeri* (American group) cl. 'Purity' (Hannibal), white-flowered, with smooth texture.

THIRD ROW, FROM TOP: *B.* x *parkeri* (American group) cl. 'Blaze' (Hannibal), with deep yellow throat, and colorful segs; *B.* x *parkeri* (American group), unnamed ruffled peppermint form with eye markings on segs near tips; [in center, a little above the four in row], *B. rosea* var. *rosea bicolor* Hort., for comparison;

[Caption—continued at the bottom of page 53—opposite.]

BRUNSVIGIA x TUBERGENII

In 1892, Messrs. Van Tubergen made the cross *Brunsvigia rosea* x *B. josephinae*. After many years the hybrids flowered, and a report appeared in Gardeners' Chronicle, Jan. 23, 1909, p. 57, with figure. This hybrid is relatively tender (Hoog, 1935; 1947), and it has not been widely grown. It is however of great interest since it is a *Brunsvigia* hybrid with a well documented record as to its parentage. The plants are marketed as seedling of a group.

The name, x*Brunsdonna* x *tubergenii*, was proposed under the assumption that two biologic genera were involved in the cross, but it has been proved conclusively as will be indicated below, that *Brunsvigia rosea*, the Cape Belladonna, belongs in the genus *Brunsvigia* and thus this is not an inter-generic but an *intra-generic* cross. Thus the name, *Brunsvigia* x *tubergenii* has to be applied.

THE CAPE BELLADONNA, BRUNSVIGIA ROSEA

One of the important parents in the breeding of the *Brunsvigia* hybrids is the Cape Belladonna, *Brunsvigia rosea* (Lam.) Hann., owing to its relatively larger, imbricated flowers. This character made it possible to achieve rapid progress toward larger-flowered hybrids. Before proceeding further however it is necessary to consider briefly the biologic status of this species.

BIOLOGIC STATUS OF THE CAPE BELLADONNA. After considering the breeding history of the *Brunsvigia* x *parkeri* hybrids, and *Brunsvigia* x *tubergenii*, a very brief statement about the biologic status of the Cape Belladonna, *B. rosea*, will suffice. Since plant science is a *science* and it is not possible to set up artificial genera, such as the attempt to maintain the Cape Belladonna as the type of a purely artificial nomenclatural, non-biologic genus for purely sentimental reasons, when all of the scientific facts (see Traub & Moldenke, 1949, pp. 64-67; Traub, 1958, pp. 236-251) show that this is untenable. The facts show that *in its morphology*, the Cape Belladonna is similar to the rest of the *Brunsvigia* species, with any differences on a species level only. The Cape Belladonna crosses with other *Brunsvigia* species *giving rise to progeny that are usually inter-fertile*. And thus there are abundant *Brunsvigia* hybrid *inter-fertile* offspring involving the Cape Belladonna in various generations after the first crosses under cultivation in various parts of the world. Thus the evidence shows that there are no differences on a generic level, and there is thus *no decided generic gap* between the

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[Caption—continued from bottom of page 52—opposite.]

B. x *parkeri* (American group) cl. 'Hibiscus Queen' (Hannibal), with broad flat face, throat and rest of segs bronze; *B.* x *parkeri alba* Hort. (Australian group), seedling with twisted segs.

BOTTOM ROW: *B.* x *parkeri rosea* Hort. (Australian group), shape and color similar to those obtained from England [*B.* x *parkeri rosea* Hort. (English group)]; *B.* x *parkeri* (American group), seedling with orchid type flowers; *B.* x *parkeri* (American group), seedling with *B. rosea* var. *pallida* markings; and *B.* x *parkeri* (American group), seedling with lavender-colored flowers. Photos by L. S. Hannibal.

Cape Belladonna and the other *Brunsvigia* species. In view of this overwhelming evidence, any statements to the contrary are academic and are outside the realm of science.

FORMS OF THE CAPE BELLADONNA, BRUNSVIGIA ROSEA.—Various forms of the species have been used in developing the *Brunsvigia* hybrids, and it is worth-while to present a brief inventory of available material for further breeding. The species and the varieties are listed below. These and the various horticultural forms are included in the Catalog of *Brunsvigia* Cultivars.

Brunsvigia rosea (Lam.) Hann. This designation of the species includes all of the following varieties and hybrids, and the horticultural forms listed in the Catalog. It is a useful handle in referring to all of them collectively.

Brunsvigia rosea var. *rosea*
This variety includes the type element and any other wild and cultivated forms associated with it. The type is a late, relatively few-flowered variety. See listing in the Catalog.

Brunsvigia rosea var. *major* Hort. This variety, with light pink flowers, is widely grown in southwestern United States, South America, Australia and elsewhere. It is a larger plant than the type and flowers earlier, and the umbel is many-flowered.

Brunsvigia rosea var. *pallida* (Delile-Red.) Hann. Hb. 10: 63. 1943. A variety with pale pink flowers; other similar forms are grouped here.

Brunsvigia rosea var. *blanda* (Ker-Gawl.) Traub, PL 16: 37. 1960. This was described in 1812 as having flowers "white fading to a blush or a pale rose color but not in streaks." It is indicated as not scented. The type plate (Bot. Mag. plate 1450) shows a yellowish throat and yellowish base of the tepaltube, but these details are not indicated in the description. The drawing of the bulb shows no basal tubular leaf-sheath. Thus it is doubtful if the statements in the literature to the contrary are well founded.

Brunsvigia rosea hybrids. There are apparently a number of hybrids between the varieties and forms, but these have not in all cases been determined.

The four reported Italian hybrids, known only from the literature (Bull. Soc. Tosc. Ortic. 20: plate 1. 1895) may belong here, and they are placed here tentatively pending further study. It is hoped that our Italian friends will trace these hybrids and report on them.

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CATALOG OF BRUNSVIGIA CULTIVAR NAMES

The species names are included for the convenience of the breeders and growers.

VALID NAMES under the International Code for Botanical Nomenclature (1956), and the International Code for Cultivated Plants (1958) are in **boldface—Brunsvigia rosea** (Lam.) Hann.; **Brunsvigia x parkeri** (Australian group) cl. **'Hathor'** (H. B. Bradley, 1911). SYNONYMS are in ordinary Roman type,—Callicore rosea (Lam.) Link=**Brunsvigia rosea** (Lam.) Hann. MISAPPLIED NAMES AND INVALIDLY PUBLISHED NAMES under the Codes, are in ordinary Roman type with double quotation marks,—"Amaryllis belladonna Herb.", not of Linnaeus (a misapplied name) =**Brunsvigia rosea** (Lam.) Hann.; "Amaryllis x spofforthiae Herb." (an invalidly published name). CLONAL NAMES in a modern language are in single quotation marks,—**Brunsvigia x parkeri** (Australian group) cl. **'Hathor'.** HYBRIDS WITH LATINIZED NAMES: in such cases a multiplication sign "x" precedes the epithet,—**Brunsvigia x parkeri** (W. Watson) Traub.

ABBREVIATIONS

Brr=**Brunsvigia rosea** var. **rosea**
BxpAm=**Brunsvigia x parkeri** American group
BxpAu=**Brunsvigia x parkeri** Australian group
BxpE=**Brunsvigia x parkeri** English group
BxpZ=**Brunsvigia x parkeri** Zwanenburg group
Bxt=**Brunsvigia x tubergenii** Hort.
cl.=Clone
fl., fld., fls.=flower, flowered, flowers
GC=Gardeners' Chronicle (London)
Hb=Herbertia, vols. 1—15 (1934-1948)
Hort.=horticulture; also when used in connection with Latinized plant names, e. g. Brunsvigia x multiflora Hort., not of Ait., it means that the name is used in horticulture without valid publication, and thus the name has no standing under the International Code.
JRHS=Journal, Royal Horticulture Society (London)
PL=Plant Life, Vols. 1—16 (1945 to date—1960)
segs=tepalsegs

sl=slight, slightly
var.=used here only in connection with Latinized names, and designates a subdivision of a species.

'Alabaster' (Cowlishaw); (ExpAu). Hb 2: plate on p. 45. 1935. Umbel 23-fld; fls pure white with yellow throat.

"AMARYLLIS Herb.", in Herb. Appendix Bot. reg. Lond. 15. 1821; Amaryll. 275-280. 1837; Baker, Amaryll. 95-96. 1888; a misapplied name (for history of misapplication see Traub & Moldenke, Amaryllidac.: Tribe Amaryll. 25-67; 1949; Traub, Amaryllis Manual, 236-251. 1959.)=**Brunsvigia** Heist.

Amaryllis banksiana Lindl.=**Brunsvigia grandiflora** Lindl.

Amaryllis x baptistii Hort.=**Brunsvigia** x **parkeri** Australian group.

Amaryllis x baptistii alba Hort.=**Brunsvigia** x **parkeri (Australian group)** alba Hort.

"Amaryllis belladonna Herb.", a misapplied name. See under "AMARYLLIS Herb.", above, for notes and literature citations.=**Brunsvigia rosea** (Lam.) Hann., **The Cape Belladonna**

"Amaryllis belladonna x alba Hort."=**Brunsvigia rosea** x **alba** Hort.

"Amaryllis belladonna alba Hort."=**Brunsvigia rosea** var. **rosea** alba Hort.

"Amaryllis belladonna blanda (Ker-Gawl.) Baker"=**Brunsvigia rosea** var. **blanda** (Ker-Gawl.) Traub

"Amaryllis belladonna x carminea Hort."=**Brunsvigia rosea** x **carminea** Hort.

"Amaryllis belladonna elata Hort."=**Brunsvigia rosea** var. **major** Hort.

"Amaryllis belladonna var. latifolia Herb."=**Brunsvigia rosea** var. **rosea**

"Amaryllis belladonna x magnifica Hort."=**Brunsvigia rosea** x **magnifica** Hort.

"Amaryllis belladonna major (err. maior) Hort."=**Brunsvigia rosea** var. **major** Hort.

"Amaryllis belladonna var. maxima (Delile-Red.) Herb."=**Brunsvigia rosea maxima** Hort.

"Amaryllis belladonna var. minor Hort."=**Brunsvigia rosea** var. **rosea**

"Amaryllis belladonna var. pallida (Delile-Red.) Herb."=**Runsvigia rosea** var. **pallida** (Delile-Red.) Hann.

"Amaryllis belladonna rubra major Hort."=**Brunsvigia rosea** x **rubra major** Hort.

"Amaryllis belladonna (rubra) minor Hort."=**Brunsvigia rosea** var. **rosea**

"Amaryllis belladonna speciosa purpurata Hort."=**Brunsvigia rosea** var. **rosea rubra** Hort.

"Amaryllis parkeri Hort."=**Brunsvigia** x **parkeri** Zwanenburg group

"Amaryllis belladonna parkeri var. Zwanenburg Hort."=**Brunsvigia** x **parkeri** Zwanenburg group

"Amaryllis belladonna purpurea major Hort."=**Brunsvigia rosea** x **purpurea major** Hort.

"Amaryllis belladonna rosea maxima Hort."=**Brunsvigia rosea** var **rosea maxima** Hort.

"Amaryllis belladonna rosea perfecta Hort."=**Brunsvigia rosea** var. **rosea perfecta** Hort.

"Amaryllis belladonna x rubra major Hort."=**Brunsvigia rosea** x **rubra major** Hort.

"Amaryllis belladonna spectabilis bicolor (err. tricolor) Hort."=**Brunsvigia rosea** var. **rosea bicolor** Hort.

"Amaryllis belladonna stenopetala Hort."=**Brunsvigia rosea** x **stenopetala** Hort.

Amaryllis blanda Ker-Gawl.=**Brunsvigia rosea** var. **blanda** (Ker-Gawl.) Traub

Amaryllis gigantea van Marum=**Brunsvigia josephinae** (Delile-Red.) Ker-Gawl.

Amaryllis grandiflora (Lindl.) Herb.=**Brunsvigia grandiflora** Lindl.

Amaryllis grandiflora var. banksiana (Lindl.) Herb.=**Brunsvigia grandiflora** Lindl.

Amaryllis josephinae Delile-Red.=**Brunsvigia josephinae** (Delile-Red.) Ker.-Gawl.

Amaryllis josephiniana Herb.=**Brunsvigia josephinae** (Delile-Red.) Ker.-Gawl.

Amaryllis josephiniana var. griffiniana Herb.=**Brunsvigia josephinae** (Delile-Red.) Ker-Gawl.

Amaryllis marginata Jacq.=**Brunsvigia marginata** (Jacq.) Ait.

Amaryllis x multiflora Hort. (not of (Ait.) D. Dietr.)=**Brunsvigia** x **parkeri** Australian group

Amaryllis multiflora (Ait.) D. Dietr.=**Brunsvigia orientalis** (L.) Eckl.

Amaryllis x multiflora alba Hort.=**Brunsvigia** x **parkeri** (Australian group) alba Hort.

Amaryllis nobilis Salisb.=**Brunsvigia orientalis** (L.) Eckl.

Amaryllis orientalis L.=**Brunsvigia orientalis** (L.) Eckl.

Amaryllis pallida Delile-Red.=**Brunsvigia rosea** var. **pallida** (Delile-Red.) Hann.

Amaryllis x parkeri W. Watson=**Brunsvigia** x **parkeri** (W. Watson) Traub

Amaryllis x parkeri rosea Hort.=**Brunsvigia** x **parkeri** (English group) rosea Hort.

Amaryllis x pseudoblanda Worsley=**Brunsvigia x parkeri** English group

Amaryllis pudica Ker-Gawl.=**Brunsvigia rosea** var. **rosea**

Amaryllis purpurascens Hort.=**Brunsvigia rosea** var. **rosea**

Amaryllis radula Jacq.=**Brunsvigia radula** (Jacq.) Ait.
Amaryllis regalis Salisb.=**Brunsvigia rosea** var. **rosea**
Amaryllis rubra major Hort.=**Brunsvigia rosea x rubra major** Hort.
Amaryllis slateriana Herb. ex Lindl.=**Brunsvigia grandiflora** Lindl.
Amaryllis speciosa purpurea Hort.=**Brunsvigia rosea** var. **rosea**
"Amaryllis x spofforthiae Herb."=**Brunsvigia x tubergenii** Hort.
Amaryllis striata Jacq.=**Brunsvigia striata** (Jacq.) Ait.
Amaryllis stricta Hort.=**Brunsvigia rosea** var. **pallida** (Delile-Red.) Hann.
Amaryllis variabilis Hort.=**Brunsvigia rosea** var. **rosea variabilis** Hort.
Amaryllis verreauxii Hort.=**Brunsvigia rosea x verreauxii** Hort.
'Arbuckle' (BxpE), GC **29**: 37-38; **53**: 71-72; 89-90; 111-112. 1901; Hb. 1: 57. 1934; JRHS Jan. 1926, p. 67; The garden **75**: 462. 1911.
"Arthington Worsley", not a clone.=**Brunsvigia x parkeri** (English group) **pseudoblanda** Hort.
"Australian Rose", not a clone.=**Brunsvigia x parkeri** (Australian group) **rosea** Hort.
'Australian Snow' (D. C. W. Chandler, 1948) (BxpAu). White without yellow throat; form in the direction of **B. rosea.**
Aylett's Hybrids=**Brunsvigia x parkeri** (Australian group)
"Baptisti", not a clone.=**Brunsvigia x parkeri** Australian group
'Barberton' (Van Tubergen), (BxpZ), in Van Tubergen Catalogue; uniform rose pink; large umbel.
Belladonna Lily, The Cape;=**Brunsvigia rosea** (Lam.) Hann.
BELLADONNA Sweet, Hort. Brit. ed. II. 506. 1830.=**BRUNSVIGIA** Heist.
Belladonna baccifera Lam.=**Brunsvigia rosea** var. **rosea**
Belladonna blanda (Ker-Gawl.) Sweet.=**Brunsvigia rosea** var. **blanda** (Ker-Gawl.) Traub
Belladonna pallida (Delile-Red.) Sweet, Hort.=**Brunsvigia rosea** var. **pallida** (Delile-Red.) Hann.
Belladonna pudica (Ker-Gawl.) Sweet.=**Brunsvigia rosea** var. **rosea**
Belladonna purpurascens Sweet.=**Brunsvigia rosea** var. **rosea.**
Belladonna purpurascens var. pallida Hort.=**Brunsvigia rosea** var. **pallida** (Delile-Red.) Hann.
Belladonna purpurea Hort.=**Brunsvigia rosea** var. **rosea**
'Betty Cowlishaw' (Cowlishaw ex Hannibal, 1947); (BxpAu). PL 15: 47. 1959. Fl alba type with radial umbel; segs medium wide, sl ruffled, reflexed
"Bidwell", not a clone; Hannibal in Hb 10: 68. 1943 = **Brunsvigia x parkeri** Australian group
'Blaze' (Aylett ex Hannibal, 1957.) (BxpAu); PL 13: 65. 1957. An introduction of W. P. Aylett, Mongoplah, N. S. W.; chrome yellow throat; flame orange segs.
'Blushing Sally' (Hannibal, 1957); (BxpAm); Pl 13: 65. 1957; Umbel many-fld; fls flesh pink; segs long, irregular, reflexed; color aging to deep bluish pink.
xBrunscore tubergenii Hort., Hannibal in Hb 10: 69. 1943.=**Brunsvigia x tubergenii** Hort.
xBRUNSDONNA Hort.=**BRUNSVIGIA** Heist.
xBrunsdonna bidwellii Worsley.=**Brunsvigia x parkeri** Australian group
xBrunsdonna blanda Hort.=**Brunsvigia x parkeri** English group
xBrunsdonna parkeri (W. Watson) Worsley.=**Brunsvigia x parkeri** English group
xBrunsdonna parkeri var. tubergenii Hort.=**Brunsvigia x tubergenii** Hort.
xBrunsdonna sanderae alba Hort.=**Brunsvigia x parkeri** (English group) **alba** Hort.
xBrunsdonna pseudoblanda Hort.=**Brunsvigia x parkeri** (English group) **pseudoblanda** Hort.
BRUNSVIGIA Heist. Descript. Brunsv. 3, cum ic. 1753 et Beschr. Brunsv. 3, cum ic. 1755; Ait., Hort. Kew. 2nd. ed. **2**: 230. 1811; Herb. Append. Bot. Reg. 16. 1821; Amaryll. 280-281. 1837; Kunth, Enum. Pl. 5: 605-606. 1850; Baker, Amaryll. 96-97. 1888; Fl. Capensis, **6**: 204-208. 1896; Traub, Herbertia **5**: 113. 1938; Hannibal, Herbertia **9**: 101-102. 1942 (1943); **10**: 55-70. 1943 (1944); Traub & Moldenke, Amaryll. 64-67. 1949; Traub, Amaryllis Manual, 236-251. 1958.
Syn.—Coburgia Herb., Bot. Mag. **47**: sub pl. 2113. 1819; Callicore Link, Handb. **1**: 193. 1839; Belladonna Sweet, Hort. Brit. 2nd ed. 506. 1830; CALLIROE Endl. Gen. 176. 1837.
Species are listed below. Hybrids, including clones, are listed separately.
Brunsvigia appendiculata Leighton, in S. Afr. Gard. **22**: 137, 143. 1932; Dyer, In PL **6**: 73-75. 1950.
Brunsvigia x baptistii Hort.=**Brunsvigia x parkeri** Australian group
Brunsvigia x bidwellii (Worsley) Traub.=**Brunsvigia x parkeri** Australian group
Brunsvigia x bidwellii rosea Hort.=**Brunsvigia x parkeri** (Australian group) rosea Hort.
Brunsvigia blanda (Ker-Gawl.) Hann., Hb 10: 62. 1943 (1944).=**Brunsvigia rosea** var. **blanda** (Kew-Gawl.) Traub
Brunsvigia bosmaniae Leighton, in S. Afr. Gard. **22**: 137, 143. 1932; Dyer, in PL **6**: 72-73, plate 8. 1950.
Brunsvigia burchelliana Herb.=**Brunsvigia radulosa** Herb.
Brunsvigia comptonii Baker, in Jour. S. Afr. Bot. **14**: 29. 1948; Dyer, in PL **6**: 72. 1950.
Brunsvigia cooperi Baker=**Brunsvigia orientalis** (L.) Eckl.

"Brunsvigia coranica Hort.", in Maund's Floral Register, 1st. ed p. 111, plate 879; Cowlishaw, in Bulb Society News-Letter, No. 70, Aug. 1955. "A hybrid raised in 1821. Flowers pure white with pale orange. It is a pale flowered variety of Bot. Reg. t: 1219."

Brunsvigia gregaria Dyer, in PL **6**: 79; 81, plate 10. 1950.

Brunsvigia gigantea Heist. ex Schult. f.=**Brunsvigia orientalis** (L). Eckl.

Brunsvigia gigantea (Van Marum) Traub, non Heist. ex Schult. F.=**Brunsvigia josephinae** (Delile-Red.) Ker-Gawl.

Brunsvigia grandiflora Lindl., in Bot. Reg. **16**: pl. 1335. 1830; Dyer, in PL **7**: 51-56, figs. 7 & 8, plates 10 & 11. 1951.

Syn.—Amaryllis banksiana Lindl. in Bot. Reg. **28**: pl. 11, 1842; Amaryllis slateriana Herb. ex Lindl. Bot. Reg. **30**: 76. 1844; Amaryllis grandiflora (Lindl.) Herb., Amaryll. 278-279. 1837; D. Dietr. Syn. Pl. **2**: 1181; Schnizlein, ic. **1**: pl. 64, 1846; Brunsvigia slateriana (Lindl.) Benth. Gen. Pl. **3**: 727. 1883; "Brunsvigia multiflora Bidwell", in GC Jul. 29, 1850, p. 470 (not of Ait.), a misapplied name= Brunsvigia grandiflora Lindl.; Amaryllis grandiflora var. banksiana Herb. Amaryl. 279, pl. 32, fig. 2. 1837; ?Brunsvigia spaerocarpa Baker, in Fl. Cap. **6**: 207. 1896.

Brunsvigia josephinae (Delile-Red.) Ker-Gawl., in Bot. Reg. sub plates 192-193. 1817; Dyer, PL **7**: 57-62, figs. 9, 10 & 11; plate 12. 1951; Allg. Deutsch. Gart. Mag. **3**: pl. 13; 14 (color). 1806; Herb., Bot. Mag. **52**: pl. 2578. 1825.

Syn.—Amaryllis gigantea van Marum, in Nat. Verh. Bat. Maats. Weetens. **3**: 345, 352, et pl. B(color). 1806; Bot. Mag. **24**: pl. 923(color). 1806, err. **ornata** var.; vide Bot. Mag. **29**: sub pl. 1172. 1809; Kerner, Hort. Sempervir. pl. 217(color). 1906; Amaryllis josephinae Delile-Red. Lil. **7**: pls. 370-372(color). 1812; Brunsvigia josephinae var. angustifolia Ker-Gawl. in Bot. Reg. **3**: pls. 192-193(color). 1817; Brunsvigia josephinae maior Burch. ex Herb., Append. Bot. Reg. pl. 2, 1821; Amaryllis josephiniana Herb. Amaryll. 278, pl. 36, figs. 2, 9. 1837; Coburgia josephinae Herb., in Trans. Hort. Soc. Lond. **4**: 181. 1822; Amaryllis josephiniana & var. graiffinia Herb. Amaryll. 278. 1837; Brunsvigia gigantea (van Marum) Traub, in Hb **5**: 132-5. 1838, non Heist. ex Schult. f. 1830.

Brunsvigia josephinae var. angustifolia Ker-Gawl.=**Brunsvigia josephinae** (Delile-Red.) Ker-Gawl.

Brunsvigia josephinae maior Burch. ex Herb.=**Brunsvigia josephinae** (Delile-Red.) Ker-Gawl.

Brunsvigia kewensis Hort.=**Brunsvigia x parkeri** English group

Brunsvigia kirkii Baker, Amaryll. 99. 1888.

Brunsvigia litoralis Dyer, in PL **7**: 62-64, fig. 11. 1951.

Brunsvigia marginata (Jacq.) Ait., Hort. Kew, ed. 2, **2**: 230. 1811, Dyer, PL **6**: 67-69, pl. 7. 1950. Syn.—Amaryllis marginata Jacq., Hort. Schoenbr. **1**: 34, pl. 65. 1797; Imhofia marginata Herb., Append. Bot. Reg. 18. 1821; Nerine marginata (Jacq.) Herb., Amaryll. 283. 1837; Elisena marginata Roem., Amaryllid. 63.

Brunsvigia minor Lindl. in Bot. Reg. **11**: pl. 954. 1826; Dyer, PL **6**: 75-76, Fig. 11. 1950.

Brunsvigia multiflora Ait.=**Brunsvigia orientalis** (L.) Eckl.

"Brunsvigia multiflora Bidwell" (not of Ait.)=**Brunsvigia grandiflora** Lindl.

"Brunsvigia x multiflora Hort." (not of Ait.)=**Brunsvigia x parkeri** Australian group.

"Brunsvigia x multiflora intermedia Hort."=Clone **'Montague'** (BxpAu).

"Brunsvigia x multiflora rosea Hort."=**Brunsvigia x parkeri** (Australian group) **rosea** Hort.

Brunsvigia natalensis Baker, in Fl. Cap. **6**: 208. 1896; Dyer, in PL **6**: 81; 83, plate 11. 1950.

Brunsvigia orientalis (L.) Eckl. in Trop. Verz. **7**: 1827; Dyer, in PL **6**: Fig. 10. 1950; **7**: 47-51, pl. 9. 1951.

Syn.—Amaryllis orientalis L. Sp. Pl. 293. 1853; Buchoz, Hist. Reg. Veg. **6**: Dec. 9, pl. 5. 1775; Jacq. Hort. Schoenbr. **1**: 38, pl. **74**. (color) 1797; Haemanthus orientalis (L.) Thunb. Prod. **1**: 59. 1790; Brunsvigia multiflora Ait., Hort. Kew, ed. 2, **2**: 230. 1811; Ker-Gawl., in Bot. Mag. pl. 1619. 1814; Herb. Amaryll. 280, pl. 36, fig. 1. 1837; Brunsvigia gigantea Heist. ex Schult. f., Syst. **7**: 841. 1830; Baker, Amaryll. 98. 1888; Coburgia multiflora (Ait.) Herb., Bot. Mag. sub pl. 2213. 1820; Amaryllis multiflora (Ait.) D. Dietr, Syn. Pl. **2**: 1180, Brunsvigia cooperi Baker, in Saund. Ref. Bot. pl. 330. 1782; Amaryllis nobilis Salisb., Prodr. 235

Brunsvigia x parkeri (W. Watson) Traub, in PL **5**: 134. 1949. Syn.—Amaryllis x parkeri W. Watson, in GC Feb. 6, 1909, p. 92. This includes all of the following **Brunsvigia x parkeri** groups.

Brunsvigia x parkeri American group. The various introduced clones are marked **(BxpAm).**

Brunsvigia x parkeri Australian group. Syn.—See Amaryllis x parkeri W. Watson under **B. x parkeri,** above. xBrunsdonna bidwellii Worsley, **JRHS 51**: 65. 1926; Brunsvigia x bidwellii (Worsley) Traub, in PL **5**: 134. 1949; "Brunsvigia x multiflora Hort." not of Ait., Cowlishaw, in Hb 2: 46. 1935; Aylett's Hybrids, Hann. in Hb 10: 66. 1943; Amaryllis x baptistii Hort., Montague catalogue; Hann. in Hb 10: 68. 1943; 'Baptisti', Hann. in Hb 10: 68. 1943; Brunsvigia x baptistii Hort., Hann. in Hb 10: 68. 1943. The various introduced clones are marked **(BxpAu).**

Brunsvigia x parkeri (Australian group) **alba** Hort. syn.—xBrunsdonna parkeri (Australian group) alba Hort., in GC Ser. III. lxxviii: 391, with fig.

1925; lxxxiv: 331, with fig. 1928; Gard. Illus. Oct. 3, with fig. 1925; JRHS 51: 66. 1926; 54: xciii, cix, Sept. 11. 1928; Amaryllis x baptistii alba Hort., Worsley, GC p. 413. 1932; "Brunsvigia x multiflora alba Hort.", Cowlishaw, in Hb 2: 46. 1935; 'White Multiflora', Hann. in Hb 10: 68. 1943.

Brunsvigia x **parkeri** (Australian group) **rosea** Hort. Syn.—"Brunsvigia x multiflora rosea Hort.", Cowlishaw, Hb 2: 46. 1935; 'Australian Rose', Hann. in Hb. 10: 68. 1943. Larger flower heads than in **Brunsvigia** x **parkeri alba** Hort.

Brunsvigia x **parkeri** English group. Syn.—Amaryllis x parkeri W. Watson in GC Feb. 6, 1909, p. 92; ser. III. 1: 210-211, fig. 101. 1911; xBrunsdonna parkeri (W. Watson) Worsley, in JRHS 51: 66-67. 1926; Amaryllis x pseudoblanda Worsley, in GC 84: 349. 1928; xBrunsdonna blanda Hort., in JRHS 54: cx. Sept. 11, 1928; Brunsvigia x kewensis Hort; Kewensis Hybrids, Hann. Hb 10: 66. 1943; 'Lady Parker', Hann. Hb 10: 66. 1943. The various introduced clones are marked **(BxpE).**

Brunsvigia x **parkeri** (English group) **alba** Hort. Syn.—xBrunsdonna x parkeri alba Hort., Worsley, in The Garden 75: 460-462. 1911; JRHS 65-69. 1926, 'White Queen', Hann. in Hb 10: 67. 1943; xBrunsdonna sanderae alba Hort., JRHS vol. 37: ccxxxi, Sept. 12. 1911; 'Sander White', Hann. Hb 10: 67. 1943.

Brunsvigia x parkeri (English group) **pseudoblanda** Hort. Syn.—xBrunsdonna pseudoblanda Hort., Worsley, in GC 1928, p. 349. A white form which turns pale with age; 'Arthington Worsley', Hann. in Hb 10: 67. 1943.

Brunsvigia x parkeri (English group) **rosea** Hort. Syn.—Amaryllis x parkeri rosea Hort., in The Garden, 1898, p. 57; GC Ser. III. 50: 211.; The Garden 75: 462. 1911, with fig. pn p. 460.
462. 1911, with fig. on p. 460. in Hb 2: 114, fig. on p. 113. 1935; Amaryllis bella-
var. Zwanenburg Hort., Hoog, in Van Tubergen's New Bulbous Plants, p. 50. 1947;
donna parkeri Hort., Hoog,
Hann., in Hb 10: 67. 1943.
The various introduced clones are marked **(BxpZ).**

Brunsvigia radula (Jacq.) Ait., Hort. Kew, ed. 2, 2: 230. 1811; Dyer, PL. 6: 70; 71, Plate 8, 1950. Syn.—Amaryllis radula Jacq., Hort. Schoenbr. 1: 35, pl. 68. 1797.

Brunsvigia radulosa Herb., Amaryll. 281, pl. 22, fig. 2; p. 423 (**B.** burchelliana), 1837; Dyer, PL 7: 45-57, plate 8, & fig. 6. 1951.

Brunsvigia rautanenii Baker, in Bull. Herb. Boiss. ser. II. 3: 667. 1902; Dyer, PL 6: 67. 1950.

Brunsvigia rosea (Lam.) Hann., in Hb 9: 101-102; 146. 1942 (1943). The Cape Belladonna.

Syn.—Amaryllis rosea Lam., Encycl. Meth. Bot. 1: 122. 1783; "Amaryllis belladonna Herb." (=Brunsvigia rosea (Lam.) Hann.) in Herb., Appendix Bot. Reg. 15. 1821; Amaryll. 275-280. 1837; Baker. Amaryll. 95-96. 1888, a misapplied name (for History of misapplication see Traub & Moldenke, Amaryllidac.: Tribe Amaryll. 25-67. 1949; Traub, Amaryllis Manual, 236-251. 1958).

This includes all of the wild varieties and forms, and also the various cultivated forms and hybrids of the species, which are listed separately below:

Brunsvigia rosea x **alba** Hort., Syn.—Amaryllis belladonna x alba Hort., in Bull. Soc. Tosc. Ortic. 20: pl. 1. (color) 1895. A reputed Italian hybrid.

Brunsvigia rosea var. **blanda** (Ker.-Gawl.) Traub, in PL Vol. 16. 1960. Syn.—Amaryllis blanda Ker-Gawl., Bot. Mag. 3: pl. 1450. 1812; Herb. Append. pl. 2. 1821; Geel, Sert. Bot. Cl: 6. (color). 1832; Reichenb., Fl. Exot. 4: pl. 258 (color). 1835; Herb., Amaryll. Pl. 36; fig. 10. 1837; Loudon, Ladies' Fl. Gard. pl. 28. 1841, in textu, Belladonna blanda in ic.; Paxton, Fl. Gard. 2: pl. 68 (color). 1851-52; Lem., Jard. Fl. 3: pl. 254 (color). 1852; Belladonna blanda (Ker-Gawl.) Sweet, Hort. Brit. ed. 2, 2: 506. 1830; Coburgia blanda (Ker-Gawl.) Herb., in Bot. Mag. 47: sub pl. 2113, p. 4, 1819; Amaryllis belladonna var. blanda (Ker-Gawl.) Baker, Amaryll. 96. 1888; GC Ser. III. liii: 441. illus. 1913; Brunsvigia blanda (Ker-Gawl.) Hann., in Hb 10: 62. 1943.

Herbert (Amaryll. 277. 1837) speculated that this might be a natural hybrid, but there is no evidence to substantiate this assertion. The type illustration (Bot. Mag. pl. 1450. 1812) shows the lvs dark dingy green, scarcely more than ½" broad; umbel 13-fld; fls about 4" long; "white fading to a blush or pale rose color but not in streaks; no scent noted; the bulb shows no basal tubular leaf-sheath.

Brunsvigia rosea x **carminea** Hort. Syn.—Amaryllis belladonna x carminea Hort., in Bull. Soc. Tosc. Ortic. 20: pl. 1 (color). 1895.

Brunsvigia rosea var. elata Hort.=**Brunsvigia rosea** var. **major** Hort.

Brunsvigia rosea var. **longipetala** (Lem.) Traub, in PL 6: 61. 1950. Syn.—Amaryllis longipetala Lem. L'Illus. Hort. 13: 78-79. 1866. A tri-colored variety; fls yellowish at the throat and exterior base, changing to white and delicate rose toward apex; with relatively long segs; discovered in S. Afr. by Vroom.

Brunsvigia rosea var. looseriana Hort.=**Brunsvigia rosea** var. **pallida** (Delile-Red.) Hann.

Brunsvigia rosea x **magnifica** Hort. Syn—Amaryllis belladonna x magnifica Hort., in Bull. Soc. Tosc. Ortic. 20: pl. 1 (color). 1895.

Brunsvigia rosea var. **major** Hort. Hann. in Hb 10: 64, Fig. 89. 1943. Syn.—Amaryllis belladonna var. major Hort. Hann. Hb 10: 64. 1943; Amaryllis belladonna var. elata Hort., Barr Catalogue; Brunsvigia rosea var. elata Hort., Hann.

10: 64. 1943; Amaryllis belladonna major Hort., Jour. Dept. Agric. Victoria 5: 725. 1907.

This variety is widely cultivated in America, Australia, Europe and elsewhere.

Brunsvigia rosea var. minor Hort.=**Brunsvigia rosea** var. **rosea.**

Brunsvigia rosea var. **pallida** (Delile-Red.) Hann. Hb. **10:** 63. 1943.

Syn.—Amaryllis pallida Delile-Red. Lil. **7:** pl. 479 (color). 1816; Amaryllis belladonna var. pallida (Delile-Red.) Ker-Gawl., Bot. Reg. **9:** pl. 714 (color). 1823; Bury, Hexand. Pl. pl. 45 (color); Belladonna pallida (Delile-Red.) Sweet, Hort. Brit. ed. II. 506. 1830; Florist's Mag. Lond. **1:** 47 (color). 1836; J. W. Loudon, Ladies' Fl.-Gard. pl. 28 (color). 1841, in textu, Belladonna purpurascens var. pallida in ic; Herb. Amaryll. 275-277. 1837; "Chilean Belladonna, or Brunsvigia rosea var. looseriana Hort., Hann. Hb **10:** 63. Fig. 89. 1943; Nat. Hort. Mag. **21:** 48. 1942 (as Amaryllis belladonna); Amaryllis striata Hort., Montague Catalogue; Brunsvigia var. stricta Hort., Hann. Hb **10:** 65. 1943.

Brunsvigia rosea var. perfecta Hort.=**Brunsvigia rosea** var. **rosea perfecta** Hort.

Brunsvigia rosea var. pudica (Ker-Gawl.) Hann.=**Brunsvigia rosea** var. **rosea.**

Brunsvigia rosea var. purpurascens Hort.=**Brunsvigia rosea** var. **rosea.**

Brunsvigia rosea x **purpurea major** Hort. Hann. Hb **10**: 66. 1943. Syn.—"Amaryllis belladonna purpurea major Hort.", Hoog. Hb **3:** 114. 1935; Hb **5:** 57. 1938; Hb 10: 66. 1943. Blooms regularly in Holland and other cooler regions; fls. deep pink changing to purplish with age.

Brunsvigia rosea var. **rosea.**

This includes the type element, and various forms associated with it. The original type is few-flowered; fls. rose-colored, throat white; segs reflexed; late blooming.

Syn.—Amaryllis rosea Lam. Encycl. Meth. Bot. **1:** 122. 1783. See under **Brunsvigia rosea** (Lam.) Hann. for the misapplied name "Amaryllis belladonna Herb.", Bot. Mag. **19:** pl. 733. 1804; Amaryllis pudica Ker-Gawl. Jour. Sci. & Arts. **2:** 379. illus. 1816; Belladonna pudica (Ker-Gawl.) Sweet, Hort. Brit. ed. 2. 506. 1830; Brunsvigia rosea pudica (Ker-Gawl.) Hann. Hb **10:** 64. 1943; Amaryllis regalis Salisb. Prodr. 232. 1796; Belladonna purpurascens Sweet, Hort. Brit. ed. 2. 506. 1830; "Amaryllis belladonna var. latifolia Herb.", Amaryll. 275. 1837; Belladonna baccifera Lam. Fl. Fr. **2:** 255; "Amaryllis belladonna (rubra) minor Hort.", Hann. Hb **10:** 65. 1943; Brunsvigia rosea var. minor Hort., Hann. Hb **10:** 65. 1943; "Amaryllis belladonna var. minor Hort." Hann. in Hb **10:** 65. 1943.

Additional illustrations: J. Miller, Illustr. Syst. Sex Linn. pl. 18. (color) 1770; Plantarum Indig. & Exot. Ic **2**: plate 63 (color). 1789; Delile-Red. Lil. pl. 180 (color). 1807; Joh. Kerner, Hort. Sempervir. pl. 378. 1813; pl. 765 (color). 1827; Maund. Bot. Gard. **13:** pl. 306. 1839-51; Tratt., Taf. Arch. iv: 369 a & b (color). 1814; Tratt., Thes. Bot. pl. 40 (color). 1819; Vellozo, Fl. Flum. **3:** pl. 116. 1827; Ann. Blumisterei **2:** 203. 1827; (pl. 10 (color). 1833); Mordant de Launay, Herb. Amat. **8:** pl. 551 (color). 1827; Drapiez, Herb. Amat. Fl. **2:** pl. 102 (color). 1829; Loudon, Ladies' Fl.-Gard. pl. 28 (color). 1841; Penfold, Madeira Fl., Fr. & Ferns, pl. 1 (color) 1845; Berge & Riecke, Giftgewaeche, pl. 40 (color). 1850; Fl des Serres, Ser. I. ix. pl. 911 (color). 1853-54; Ill. Hort. **6:** 228. color illus. 1859; A. Braun in Abh. Akad. Berlin, 1850, pl. 6, Fig. 9. 1860; Decaisne & Naud., Amat. Jard. **2:** 216. 1862-66; Reveil, Rigne Veg. **14:** pl. 20 (color). 1870; Eeden, Album Bulb Pl. 40 (color). 1872-81; Pinto, Diccion Bot. Brasil, fig. 16. 1873; Decaisne, Naud. & Hemsl., Trees, shrubs & Herbs. Pl. 181. 1873; Jour. Hort. liv. 184. 1875; ser. III. xlviii. 116. 1904; liii. 301. 1906; lxi. 388. 1910; lxviii. 445. 1913; lxxi. 177. 1915; Florist, 1881, p. 185.; W. Robinson, Engl. Fl. Gard. pl. 11. 1883; Nicholson, Illustr. Gard. Dict. **1:** 62. 1884-88; Jardin **2:** 42. 1888; Garden, xxxiii. 268. 1888; xliii. 490. 1893; lxxv. 483. 1911; Bois, Dict. Hort. 73. 1893; Brehm, Mem. Nat. Mondes des Pl. **2:** 572. 1894-96; Gard. Chron. Ser. III. xxiv. 315. 1898; xxxvi. 454. 1904; Bull. Arboricult. Belg. p. 35. 1904; Marloth, Fl. S. Afr. iv. pl. 37, 38 (color). 1915; Marloth, Fl. S. Afr. **3:** 262. 1932; Strong, American Fl. **3:** 37 (color). 1849.

Brunsvigia rosea var. **rosea bicolor** Hort. Hann. in Hb. **10:** 65. 1943. Syn.—"Amaryllis belladonna spectabilis bicolor Hort.", Wein. ill. Gart.-Zeit. **15:** 361. illus. 1890; **21:** 215. illus. 1896; Sprenger, Gartenfl. **45:** 358. illus. 1896. err. A. b. spectabilis tricolor: "Amaryllis speciosa purpurea Hort.", Barr, Catalogue, Hb **10:** 65. 1943. A rich rose-purple fls; white throat; fls in Aug.

Brunsvigia rosea var. **rosea maxima** Hort., Hann. Hb **10:** 64. 1943. Syn.—"Amaryllis belladonna rosea maxima Hort.", Barr, Catalogue; Gardener's Mag. **45:** 303; Hb 10: 64. 1943; "Amaryllis belladonna var. maxima Hort.". Early flowering, large deep rose; umbel 9-10-fld; very vigorous.

Brunsvigia rosea var. **rosea perfecta** Hort. syn.—"Amaryllis belladonna rosea perfecta Hort.", Wein Illus. Gart.-Zeit. **20:** 361. illus. 1890; **21:** 214. illus. 1866; Gartenfl. xlv: 443. illus. 1896.

Brunsvigia rosea var. **rosea rubra Hort.** Syn.—"Amaryllis belladonna rubra Hort.", Flore des Serres, Ser. 2. **4:** pl. 1415 (color). 1861; Cowlishaw, Hb **2:** 46. 1935; Amaryllis rubra major Hort., GC Ser. 3. lxxxiv: 349. illus. 1928; "Amaryllis belladonna speciosa purpurata Hort." Hann. Hb **10**: 65. 1943; Brunsvigia rosea var. rubra Hort., Hann. Hb **10:** 65. 1943.

Brunsvigia rosea var. **rosea variabilis** Hort. Syn.—Amaryllis variabilis Hort., in Montague Catalogue; Brunsvigia rosea variabilis Hort. Hann. Hb 10. **10:** 66. 1943. Opens nearly white; deepens to ruby red with age; free-flowering; segs narrow; common name "Table Mountain Lily."

Brunsvigia rosea x rubra major Hort. Syn.—Amaryllis rubra major Hort. Elwes, GC **84:** p. 349. with fig. 1938; "Amaryllis belladonna x rubra major Hort.", Hoog, in Van Tubergen's New Bulbous Plants. p. 50. 1947. Origin unknown; bulb with pronounced basal tubular leaf-sheath; leaves wide; free-flowering; segs narrow, 1" wide; fls brilliant crimson-rose with yellow base; plant hardy; obtained by Elwes about 1913.

Brunsvigia rosea x stenopetala Hort., Syn.—"Amaryllis belladonna x stenopetala Hort.", in Bull. Soc. Tosc. Ortic. **20**: pl. 1 (color). 1896.

Brunsvigia rosea var. stricta Mort.=**Brunsvigia rosea** var. **pallida** (Delile-Red) Hann.

Brunsvigia rosea variabilis Hort.=**Brunsvigia rosea** var. **rosea variabilis** Hort.

Brunsvigia rosea x verreauxii Hort. Syn.—Amaryllis verreauxii Hort., Jour. et Flore Jard. **2**: pl. 119. 1832.

Brunsvigia slateriana (Lindl.) Benth.=**Brunsvigia grandiflora** Lindl.

Brunsvigia sphaericarpa Baker—**Brunsvigia grandiflora** Lindl.

Brunsvigia striata (Jacq.) Ait., Hort. Kew, ed. 2, **2:** 231. 1811; Dyer, in PL **6:** 76, 79, pl. 9. 1950. Syn.—Amaryllis striata Jacq., in Hort. Schoenbr. **1**: 36, pl. 70. (color). 1797; Tratt., Hort. Ausw. Gartenfl. **1**: pl. 29 (color). 1821.

Brunsvigia x tubergenii Hort. Syn. "Amaryllis x spofforthiae Herb.", in Amaryll. 278-279; 422; 425. 1837, invalidly published name; **(B. rosea** var. **blanda x B. josephinae):** (xBrunsdonna) Messrs. Van Tubergen, in GC Jan. 23, 1909, with fig. in suppl. (without specific name); xBrunsdonna tubergenii Hort., Haggag, Hort. Rev. Egypt, no. 39, p. 5, with fig. 1918; Messrs. Van Tubergen, in New **Bulbous Plants,** pp. 52-53. 1947; xBrunsdonna parkeri var. tubergenii Hort., Worsley, in JRHS **51**: 66-67. 1926. See also under 'Selkirk's Red'; 'Queen Wilhelmina', and 'Van Tubergen' Hann. in Hb **10**: 69. 1943.

Bulb without deciduous basal tubular leaf-sheath; fl. in Sept.; umbel 22-fld.; fls clear, deep rose, suffused with carmine.

Brunsvigia undulata Leighton, in Fl. Pl. S. Afr. **14**: pl. 552. 1934; Dyer, in PL **7**: 57. 1951.

CALLICORE Link, in Handb. **1**: 193. 1829.=**BRUNSVIGIA** Heist.

Callicore rosea (Lam.) Link, in Handb. **1**: 193. 1829=**Brunsvigia rosea** (Lam.) Hann.

CALLIROE Endl. Gen. 176. 1837=**BRUNSVIGIA** Heist.

Cape Belladonna, The;=**Brunsvigia rosea** (Lam.) Hann.

'Cape Town' (Van Tubergen); (BxpZ), Van Tubergen Catalogue. Fls rose red; rounded umbel; very free-flowering.

"Chilean Belladonna" **Brunsvigia rosea** var. **pallida** (Delile-Red.) Hann.

COBURGIA Herb. (1819)=**BRUNSVIGIA** Heist.

COBURGIA (Herb.) Traub, subgenus of genus **BRUNSVIGIA** Heist., in PL **15:** 17. 1959. Syn.—COBURGIA Herb., in Bot. Mag. **47:** sub pl. 2113, pp. 4-5. 1819.

Coburgia blanda (Ker-Gawl.) Herb.=**Brunsvigia rosea** var. **blanda** (Ker-Gawl.) Traub.

Coburgia josephinae (Delile-Red.) Herb.=**Brunsvigia josephinae** (Delile-Red.) Ker-Gawl.

Coburgia multiflora (Ait.) Herb.=**Brunsvigia orientalis** (L.) Eckl.

Coburgia pudica (Ker.-Gawl.) Herb.,=**Brunsvigia rosea** var. **rosea.**

'Concord Lass' (Hannibal, 1957); (BxpAm); in PL **13:** 65. 1957; segs snow white with tips faintly marked flesh pink.

'Cream Pitcher' (Hannibal, 1957); (BxpAm); in PL **13**: 65. 1957. Cream white clone derived from 'Hathor'; segs broad and ruffled; throat deep butter yellow.

'Durban' (Van Tubergen); (BxpZ); Van Tubergen Catalogue; fls carmine red; white center; umbel rounded; free-flowering.

Elisena marginata (Jacq.) Roem. **Brunsvigia marginata** (Jacq.) Ait.

"Elwes Rubra"; not a clone. **Brunsvigia rosea x rubra major** Hort.

'Ethyl Houdyshel' (Hannibal, 1943); (Brr); Hb **10**: 66. 1943. Fls rose-colored changing to deeper rose with age; throat white.

'Frank Leach' (Hannibal, 1943); (BxpAm); in Hb **10**: 66-67, Fig. 89. 1943. Plant with deciduous basal leaf-sheath; fls in Aug; fls pale to deep satiny pink; fragrant; segs narrow.

'G. H. Frances' (Montague); (Brr); in Montague Catalogue; Hann. in Hb **10:** 64. 1943. fls deep pink.

'Glory' (Clarke ex Hannibal), (BxpAu); Hann., in PL **11**: 61. 1955; Allister Clarke introduction; umbel many-fld; deep rich red.

'Grace' (Hannibal, 1957); (BxpAm); in PL **13**: 65. 1957. Back-cross of 'Frank Leach' on **B. rosea;** umbel compact, fls ruffled, light pink with picotee markings.

Haemanthus orientalis (L.) Thunb.=**Brunsvigia orientalis** (L.) Eckl.

'Harboard' (Holloway); (BxpAu); Hb **2**: 46. 1935.

'Hathor' (H. B. Bradley, 1911); (BxpAu); Hb **2**: 46. 1935; Fls pure white, small yellow throat; segs ruffled, margins undulating. Reputed B. josephinae x **B.** x parkeri Australian group, according to Cowlishaw. RHS-NSW Baptist Award, 1911.

'Hibiscus Queen' (Hannibal, 1960); (BxpAm); in PL vol. 16. 1960. Fls. bronze, turning pink in setseg area; segs wide, linear.

Imhofia marginata (Jacq.) Herb.=**Brunsvigia marginata** (Jacq.) Ait.

'Jagersfontein' (Van Tubergen); (BxpZ); Van Tubergen Catalogue; Hb **10:** 67. 1943. Fls deep rich pink; yellow throat; fls. large.

'Janice Gayle' (Hannibal, 1957); (BxpAm); in PL **13**: 65. 1957. Back-cross 'Hathor' on **B. rosea;** 10-12-fld; fls widely flared; throat short, light yellow, segs slender, reflexed, tips colored bright pink.

'Johannesburg' (Van Tubergen); (BxpZ); Van Tubergen Catalogue; Hb **10**: 67. 1943; Fls light rose, white throat, yellow base; free-flowering.

"Kewensis Hybrids".=**Brunsvigia** x **parkeri** English group.

'Kimberley' (Van Tubergen); (BxpZ), Van Tubergen Catalogue; Hb **10**: 67. 1943. Fls deep pink, segs sl. striped, again to deep pink.

"Lady Parker"; not a clone.=**Brunsvigia** x **parkeri** English group.

Leopoldia belladonna M. Roem. Syn. Ensat. 129. 1847=**Brunsvigia rosea** (Lam.) Hann.

'Montague' (Hannibal, 1943): (AxpAu); Hann. in Hb **10**: 68. 1943. Syn.—Brunsvigia multiflora intermedia Hort., Montague Catalogue. Fls cream white, sl. shaded pink.

Nerine marginata (Jacq.) Herb.=**Brunsvigia marginata** (Jacq.) Ait.

"Oarhurst Hybrids", Hann. Hb **10**: 67. 1943. Various **Brunsvigia** x **parkeri** clones and seedlings.

'Orpet White' (Hannibal, 1943); (BxpAm); Hann. in Hb **10**: 68. 1943. Seedling of 'Hathor'; fls nearly white.

"Orpet White Hybrids" (BxpAm), Calif. Hort. Jour. **13**: 13. 1952. Segregates from bulbs imported from Mrs. Bullard in Australia.

'Ovieto' (Holloway); (BxpAu); Hb **2**: 46. 1935. Fls deep pink.

'Pacifica' (Hannibal, 1957); (BxpAm); PL **13**: 66. 1957. Fls perfectly shaped; very pale pink, short white tepaltube; segs very broad; fls long lasting.

'Perfecta' (Montague); (Brr); in Montague Catalogue; Hann. Hb **10**: 64. 1943. Dwarf habit; fls large, pink and white.

'Picotte' (Hannibal, 1955); (BxpAm); in PL **11**: 61. 1955. 'Hathor' x 'Frank Leach'; umbel many-fld; fls ruffled, pinkish color tends to concentrate on margins of segs giving a picotee effect.

'Pretoria' (Van Tubergen); (BxpZ); Van Tubergen Catalogue; Hb **10**: 67. 1943. Fls large, deep pink, white throat, yellow base.

'Purity' (Hannibal, 1957); (BxpAm); in PL **13**: 65. 1957. 'Hathor' self; fls large snow white, segs very broad, regular, reflexed, spirally arranged.

"Queen Wilhelmina", not a clone.=**Brunsvigia** x **parkeri** Zwanenburg group.

'Radiata Queen' (Hannibal, 1960); (BxpAm); Pl Vol. 16. 1960. 'Hathor' self; pure white; umbel 30-fld; fls in large **radial** umbel about 18" in diam., hence its name.

'Red Shadow' (Hannibal, 1955); (BxpAm); PL **11**: 61. 1955. Brunsvigia rosea var. rosea bicolor Hort. x 'Hathor'; like **B. rosea** var. **major** Hort., in shape; white tepaltube; brilliant rose red segs.

'Sander White", Hann. in Hb **10**: 68. 1943.=**Brunsvigia** x **parkeri** (English group) sanderae alba Hort.

'Santa Barbara' (Hannibal, 1943); (BxpAm); Hann. Hb **10**: 67. 1943. Late rose and white with yellow-orange throat; tender to frost.

'Selkirk's Red' (Selkirk); (Bxt); cross of **B. josephinae** x **B. rosea;** fls deep rose red with narrow unbalanced segs.

'Spider' (Hannibal, 1960); (BxpAm), Pl Vol. 16. Fig. 18. 1960. Cross of **B. rosea** var. **pallida** type with narrow-seged 'Hathor' seedling; segs very narrow, reflexed; tepaltube butter yellow, rest of fl soft pink darkening with age.

'Stellenbosch' (Van Tubergen); (BxpZ); Van Tubergen Catalogue; Hb **10**: 67. 1943. Fls large, large white center, segs edged with pink lines; throat yellow.

'Stormy Sunset' (Hannibal, 1955); (BxpAm); JRHS 1955, p. 519; PL **13**: 99. 1957. Fls medium small, short trumpeted; tepaltube deep copper bronze, rest of fl deep red to red-purple; umbel 12-14-fld, radial. 'Sunset' is similar in color but lighter.

'Sunset' (Cowlishaw ex Hannibal): (BxpAu); in PL **15**: 47. 1959. Fls radial, medium-sized; throat deep yellow inside, copper red on outside; segs rich pink.

"Van Tubergen", not a clone.=**Brunsvigia** x **tubergenii** Hort.

'White Jasmine' (Hannibal); (BxpAm); syn.—**Brunsvigia** x **parkeri** (Australian group) alba Hort.; Strout, in Hb **15**: 159, fig. 209. 1948. Segregate from 'Hathor' with very narrow, linear segs, reflexed. This may be a parent of 'Spider', according to Hannibal.

"White Multiflora", not a clone.=**Brunsvigia** x **parker** (Australian group) alba Hort.

"White Queen", not a clone.=**Brunsvigia** x **parkeri** (English group) alba Hort.

'Windhoek' (Van Tubergen); (BxpZ); Van Tubergen Catalogue. Fls rose; white throat.

"Zwanenburg Hybrids".=**Brunsvigia** x **parkeri** Zwanenburg group.

CATALOG OF HYBRID **NERINE** CLONES

1882—DEC. 31, 1958

Compiled by EMMA D. MENNINGER,
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INTRODUCTION

THE INTERNATIONAL CODE OF NOMENCLATURE FOR CULTIVATED PLANTS, 1958, Article 26 states: "In order to be valid the publication of a cultivar (variety) name after 1 January 1959 must be accompanied by a description or by a reference to a previously published description." Therefore, it may be assumed that this list of names of nerine clones in cultivation previous to January 1, 1959, whether published or not, is valid.

Since to my knowledge, no list of hybrid nerine clones has been published, an attempt has been made to compile a fairly complete list. Because of the limitations of time and of available reference material, it is not to be hoped that this list of some 350 names is complete or without errors. Any additions or corrections will be welcomed by the compiler.

Where other information is available for awarded clones, reference to publication is omitted, since this is easily available in the Journal of the Royal Horticultural Society. The earliest hybrids that were found were 'Cami' and x *excellens,* both listed for 1882. The records in many cases are very vague as to the name of the hybridizer and date of origination. Therefore this feature of the list may seem very incomplete.

It is hoped that nerine hybridizers will take advantage of the opportunity of registering new *Nerine* clones in the AMARYLLIS YEAR BOOK edition of PLANT LIFE, giving a description as required by the Code with any other pertinent data, and thus assure the validity of the new names.

HYBRIDIZERS, GROWERS, SUPPLIERS AND EXHIBITORS OF HYBRID NERINE CLONES

ABBREVIATION	NAME, ETC.
A	Anderson, E. B. English grower.
B	Barr, Peter. Early English hybridizer, grower and exhibitor.
Be	Bennett-Poe, J. T. Early English hybridizer.
Bu	Butchert, Thos. Croydon, England. Supplier.
C	Cam, Dr. Early English grower.
Ch	Chapman, H. Hybridizer and exhibitor.
Cl	Clarke, Mrs. and Col. S. R. Clarke. Borde Hill, England. Hybridizers, growers and exhibitors.
Cr	Cranfield, W. B. Enfield, England. Exhibitor.
E	Elliott, H. Sussex, England. Hybridizer and exhibitor.
El	Elwes, H. J. Colesborne, England. One of the most active early English hybridizers and exhibitors.
F	Fletcher, W. H. B. Hybridizer of the bigeneric hybrid *N.* x *fletcheri.*
G	Godman, F. D. Horsham, England. Early hybridizer and exhibitor.

H	Hanger, Francis. Curator RHS Gardens, Wisley, England. Hybridizer.
He	Herbert, Wm. [1778-1847] Early hybridizer and Amaryllid authority.
Ho	Houdyshell, Cecil. La Verne, California. Supplier.
J	Jacob, Rev. J. Hybridizer and exhibitor.
Ja	James, W. M. California. Hybridizer and grower.
Jo	Joel, H. J. St. Albans, England. Grower and exhibitor.
K	Kew Gardens, England. Growers.
L	Lilley, F. Hybridizer and exhibitor.
M	Mansell. Early hybridizer.
Me	Menninger, E. Greenoaks, Arcadia, California. Hybridizer and grower.
O	Oakhurst Gardens. J. Giridlian, Arcadia, California. Supplier.
O'B	O'Brien, James. Early English hybridizer.
Or	Orpet, E. O. [1863-1956] Former supplier. Santa Barbara, California.
P	Palos Verdes Begonia Farm. Waltheria, California. Grower and supplier.
R	Rice, W. E. Former California supplier.
Ro	Rose. J. Oxford, England. Grower and exhibitor.
ER	Rothschild, Edmund de. Exbury, England. Hybridizer, grower and exhibitor.
LR	Rothschild, Lionel de. Exbury, England. Former hybridizer and grower and exhibitor.
S	Stern, Col. F. C. Sussex, England. Hybridizer and grower.
St	Strickland, Sir Charles. Early English hybridizer.
V	Vandertang's Nurseries. Guernsey, Channel Islands. Exhibitors.
Ve	Veitch Exotic Nurseries. Hybridizers and growers, formerly of Chelsea, England.
W	Ware, T. S., Hybridizer and grower.
Wa	Watkins & Simpson, Covent Garden, London. Suppliers.
Wi	Wisely, Royal Horticultural Society Gardens. England. Growers.
Win	Winkfield Manor Nurseries. Ascot, Berkshire, England. Suppliers.

LITERATURE REFERENCES WITH ABBREVIATIONS

BS	Bailey, L. H. Standard cyclopedia of horticulture. 4 vols. 1935 ed.
GC	Gardeners' Chronicle, London.
FS	Flora and silva, ed. by W. Robinson. Nerines in vol. 3, 1905.
H	Herbertia, [1934-1948] ed. by Hamilton P. Traub and Harold N. Moldenke.
JRHS	Journal of the Royal Horticulture Society, London.
M	Macself, A. J. Amateur's greenhouse. 2nd ed., n. d. (Before 1941)
N	Nicholson, George. Illustrated dictionary of gardening. 4 vols. 1884-1888.
NS	———— Second supplement. 2 vols. 1901.
P	Palos Verdes Begonia Farm. How to grow nerines. Gives descriptions. n. d.
PB	Plant buyer's guide. 6th ed. 1958.
PL	Plant Life, [1945-to date] ed. by Hamilton P. Traub and Harold N. Moldenke.
RHSDS	Royal Horticultural Society. Dictionary of gardening. Supplement 1956.

[**CATALOG, NERINE CLONES, ABBREVIATIONS,** continued on page 74.]

CATALOG OF HYBRID NERINE CLONES, 1882—DEC. 31, 1958

NAME	HYBRID-IZER	G=GROWER S=SUPPLIER	2n	AWARD	PUBLICATION, DESCRIPTION AND CROSS
'Aachen'		G-ER&Me			Rose pink, narrow tepalsegs.
'Abundance'		G-Wi	22		JRHS:372, 1951.
'Adela'	Cl	G-Cl	22		JRHS:372, 1951. 'Countess Grey' x 'Aurora'.
'Aerolite'		G-ER&Me			PL:140, 1959. Parent of many fine ER hybrids.
'Alice'	LR	G-ER&Me	36	FCC, ER, 1945	JRHS:258, 1946 & 375 illus. fig. 173, 1951. ♀ parent of 'Inchmery Kate'.
'Alpha'	Me	G-Me			Salmon, narrow tepalsegs, but nice.
x **amabalis**					BS:2138, 1935. **N. pudica x humilis major.** Rose with darker stripe.
'Amalfi'	ER	G-ER&Me			Deep pink.
'Amoretta'		G-Wi	22		JRHS:372, 1951.
'Andromeda'		G-ER&Me			Cerise.
'Apache'	LR?	G-ER&Me		PC, LR, 1933	JRHS:cxxv, 1934. No description.
'Arcadia'	Me	G-Me			PL:141, 1959. Turkey red HCC 721/3 and 721/2.
'Argonaut'	ER	G-ER&Me			Salmon.
'Aries'		G-ER&Me			JRHS:258, 1946. "Darkest of all nerines".
'Arnhem'	ER	G-ER&Me		AM, ER, 1944	Fine large scarlet. A **N. fothergillii** hybrid
'Athene'		G-ER&Me	22		JRHS:372 1951.
x **atrosanguinea**	M				N vol.4:573, 1888; FS:123, 1903. **N. plan'ii x flexuosa.** 1883.
'Attar'					JRHS:cxxvi, 1934. Exhibited by A. Worsley. No award or description.
'Aurora'	Ro?	G-ER&Me	33	FCC, Ro, 1920	Fine satiny rose. **N. curvifolia x bowdenii.** Not summer dormant.
'Avalon'	Me	G-Me			PL:140; illus.:141, 1959. Good deep pink.
'Bagdad'		G-ER&Me	25		JRHS:374, 1951. **N. fothergillii** x 'Purple Prince'.
'Balmoral'		G-ER&Me			Rose pink with lavender median line.
'Barbara'	LR	G-ER	22		JRHS:258, 1946 & 372, 1951. Shell pink.
'Barcarolle'		G-P			P-list; old rose, gold dusted.
'Basil'	H	G-Wi	24		JRHS:374, 1951. 'Francis' x 'Edith Amy'.
'Battersea'	ER	G-ER&Me			Scarlet.
'Beacon'					RHSDS:52, 1956. Soft coral scarlet.
'Ben Hendy'	ER	G-ER&Me			Deep salmon.
'Ben Hills'	ER	G-ER&Me			Beautiful crimson.
'Bengal Rose'	Me	G-Me			Brilliant rose bengal HCC 25/1 & 25/-.
'Best Blue'		G-ER&Me			Dark blue.
'Best Mauve'		G-ER&Me			
'Best White'		G-ER&Me			
'Blazing Star'		G-P			P-list; fiery scarlet with large umbels.
'Blenheim'	ER	G-ER&Me			Pale mauve salmon red vein.
'Blue Gem'	Me	G-Me			Old rose and blue.
'Blue Seedling'		G-ER&Me			Blue and magenta.
'Bright Scarlet'					Has been reported in unnamed cross with Herga.
'Briquete'			23		JRHS:374, 1951.
'Bunty'	Cl	G-Cl	22		JRHS:372, 1951. 'Countess of Altamont' x 'Mrs. Clarke'.
'Burgundy'		G-P			JRHSDS:52, 1956. Copper red and mauve.

NAME	HYBRIDIZER	G=GROWER S=SUPPLIER	2n	AWARD	PUBLICATION, DESCRIPTION AND CROSS
'Burma Road'		G-ER			JRHS:258, 1946. Light crimson, strong grower.
'Cachary'		G-ER&Me			Magenta and blue.
x **caerulea**					RHSDS:270, 1956. **N. sarniensis x pudica.**
'Cami' (or x **camii**)	C?				N vol.4:573, 1888. **N. sarniensis x curvifolia.** 1882 pink & blue hybrid.
'Candida'					BS:2136, 1935. Pure white, 15 to 20, 2 inch flowers.
'Candystick'	Me	G-Me			PL:137, 1959. White with magenta median stripe.
'Cardinal'	ER	G-ER		AM, ER, 1945	Deep blood red HCC 820/-.
'Carita'	ER	G-ER&Me			Pale pink.
'Carmenata' (& 'Carmenita'?)	LR	G-ER&Me	33		JRHS:375, 1951. 1933 hybrid. Salmon pink, mauve median line.
'Carole'	Me	G-Me			Scarlet.
'Carolyn'	H	G-Wi	33		JRHS:375, 1951. 1948 hybrid.
'Caryatid'	ER	G-ER&Me		AM, ER, 1947	Mandarin Red HCC 17/1. 17 flowers.
'Castletop'	Cl	G-Cl		PC, Cl, 1957	JRHS:67, 1957. No description.
'Cerise'		G-ER&Me			Rose with lavender stripe.
'Chameleon'	Ja		22		H:135, 1940 & 115, 1941. **N. filifolia x corusca.** Evergreen rose & purple.
'Chanticleer'		G-ER&Me			Dark purple with magenta stripe.
'Cherry Ripe'	Me	G-Me			Cherry HCC 722/- with lighter tones.
'Chloe'	ER	G-ER&Me			Pale salmon.
x **cinnabarina**	M				NS:552, 1901. Cinnabar scarlet. **N. curvifolia x flexuosa.**
x **colossum**		G-K	33		JRHS:375, 1951. Old hybrid grown at Kew.
'Coralina'		G-Cl	22		JRHS:372, 1951.
'Coronation'	ER	G-ER&Me		AM, ER, 1953	Porcelain rose HCC 620/-.
'Countess Bathhurst'					
'Countess Grey'		G-El		AM, El, 1897	Large blush white, rose stripe.
'Countess of Altamont'	G?				JRHS:372, 1951. Parent of 'Adela'.
'Crimson King'				AM, G, 1908	Shrimp pink, vigorous grower.
'Crimson Seedling'		G-E	33	AM, E, 1906	JRHS:371, 1951. Crimson, broad recurving tepalsegs
'Cupid'	ER	G-Me, S-Bu			Pale pink.
'Curiosity'	El	G-ER&Me, S-Win			JRHS:374, 1951.
'Dark Crimson'		G-Cl	24		Fine dark red.
'Dark Seedling'		G-ER&Me			Dark orange scarlet.
'Dawn'		G-ER&Me			P-list: pink with gold and mauve, fine umbel.
'Desdemona'		G-P			Rose pink with salmon tinge.
'Diana Oliver'		G-ER&Me			JRHS:374, 1951.
'Dolores'	ER	G-Cl	22		Bright pink.
'Duchess'		G-ER&Me S-Win			
'Dunkirk'	LR	G-ER&Me			
'Eddy' (or x **eddii**)		G-ER&Me	33	AM, ER, 1942	JRHS:375, 1951. Cherry HCC 722/-. 1940 hybrid.
'Edith Amy'	LR	G-ER			JRHS:258, 1946. "Best true orange".
'Electra'		G-ER&Me	33	AM, ER, 1942	JRHS:375, 1951. Light salmon pink. 'Aurora' x ?
x **elegans**	W	G-K	22(26)	var. alba FCC, W, 1893	Old rose. JRHS:373 & 374, 1951. **N. flexuosa x sarniensis.**

NAME	HYBRID-IZER	G=GROWER S=SUPPLIER	2n	AWARD	PUBLICATION, DESCRIPTION AND CROSS
x **elegantissima**	L		28	*AM, L, 1910*	*H:115, 1941 & JRHS:374, 1951.* ***N. x mansellii*** *hybrid. Cerise.*
'Empire Day'		*G-P*			*RHSDS:52, 1956. Glowing rose crimson, strong grower.*
x **eruhescens**					RHSDS:271, 1956. Syn. of ***N. roseo-crispa & pulchello-undulata.***
'Eve'	ER	G-ER&Me			Pale pink.
x **exburiense**		G-ER			JRHS:258, 1946. Salmon with white center.
x **excellens**	He		28	FCC, W, 1888	N vol. 2:447, 1885 & JRHS:374, 1951. Carmine rose of 1882.
'Exonia'		G-K	22	AM, Ve, 1919	JRHS:373, 1951. **N. bowdenii x fothergillii.** Cerise.
'Fairy Wand'	Me	G-Me			Pl:141, illus.139, 1959. Geranium lake HCC 20/-, crisped tepalsegs.
'Falaise'	ER	G-ER		AM, ER, 1947	Scarlet HCC 19/-. 15 flowers to umbel.
'F. D. Godman'	G?			AM, G, 1907	Pink tepalsegs with waved ends.
'Festival of Britain'	ER	G-ER&Me			Salmon.
'Firebird'		G-ER&Me			Fine scarlet.
'Firewheel'	Me	G-Me			Bright scarlet.
'Flamboyant'	Me	G-Me			PL.141, 1959; illus.:139. Fine large flame color.
'Flame'		G-ER&Me			
x **fletcheri**	F		22		JRHS:370, 1951. Cape belladonna (**Brunsvigia rosea**) x Nerine ?
'Flexudica'					JRHS:488, 1908-9. **N. flexuosa x pudica.**
'Francis'	LR		22		JRHS:373, 1951. 1941 hybrid.
'Fred Wynniatt'	ER	G-ER&Me		AM, ER, 1955	Vermilion HCC 18/-. 'Carminata' x 'Joan'.
'Fuchsine'		G-A			JRHS:125, 1956. Pink.
'Gaby Deslys'		G-ER&Me&S	22		JRHS:372, 1951.
'Gazelle'		G-ER&Me			
'Giantess'		G-B		AM, B, 1913	Large carmine. **N. bowdenii** ♀ x **Corusca major** ♂.
'Glitter'		G-B		AM, B, 1922	Rich orange scarlet, waved tepalsegs.
'Gloaming'	S	G-S	22		JRHS:373, 1951.
'Glory of Sarnia'			33	AM, B, 1913	JRHS:371, 1951. **N. corusca major** ♀ x **fothergillii** ♂. Scarlet.
'Good Pink'		G-ER&Me			
'Good Red'		G-ER&Me			
'Granada'	Me	G-Me			Large deep orange pink.
'Grilse'	S	G-S	22		JRHS:373, 1951.
'Hadrian'	LR	G-ER	22		JRHS:373, 1951. 1941 hybrid.
'Hamilton'		G-ER&Me			
x **haylockii**	He				BS:2138, 1935. **N. sarniensis x flexuosa.** One of the oldest.
'Hebron'		G-ER&Me			Coral.
'Helene'	ER	G-ER&Me			Pale pink.
'Helena Chapman'		G-S	22		JRHS:372, 1951.
'Henrietta'		G-ER&Me			Cherry HCC 722/2.
'Henry Elwes'	El			PC, El, 1946	JRHS:v, 1947. No description.
'Her Majesty'		G-P			P-list: glowing rose cerise, gold dusted. Extra fine.
'Hera'	Ro	G-ER&Me&P	33	FCC, Ro, 1920	JRHS:375, 1951. Large rose pink, fairly hardy.

NAME	HYBRIDIZER	G=GROWER S=SUPPLIER	2n	AWARD	PUBLICATION, DESCRIPTION AND CROSS
'Herga'	LR	G-ER&Me	33	AM, ER, 1942	JRHS:375, 1951. Cherry HCC 722/- 'Purple Prince' x ***N. fothergillii.***
'Hilda'		G-P			P-list: tall light salmon, gold dusted.
'His Majesty'	B	G-K	22	AM, B, 1922	JRHS:373, 1951. Striking glowing scarlet.
'Honourable Miss Gibbs'	El			AM, El, 1911	Sparkling deep velvety crimson.
'Honourable Mrs. Wynne'	Cl		22		JRHS:373, 1951. Orange scarlet.
'Hood'	ER	G-ER&Me			Red.
'Horsa'		G-ER&Me			Shell pink.
'Hurricane'	LR		22		JRHS:373, 1951. 1937 hybrid.
'Inchmery Elizabeth'	ER	G-ER&Me		AM, ER, 1949	Dutch vermilion HCC 717/-. Fine flowers 2½ inches across.
'Inchmery Kate'	LR	G-ER&Me	44	AM, ER, 1949	JRHS:366, 1951; illus. fig. 174 1951. Rose Pink HCC 427/3. 3 inch flowers.
'Ingens'	Ja?	G-P&Ja?	33(32, 34)		H:234; illus. pl.84, 1937 &:115, 1941.
'Inominata'		G-S	22		JRHS:373, 1951.
'Irene'		S-Win			
'Isobel Beckwith'	El			PC, El, 1934	Salmon pink with broad crisped tepalsegs.
'Ispahan'	ER	G-ER&Me			Orange flushed mauve.
'Jarabutt'		G-ER&Me,			Claret rose HCC 021/- with lighter centers.
'Jewel'		G-S	22		JRHS:373, 1951.
'Joan'	LR	G-ER&Me S-Win			
'Jocelyn'	ER	G-ER&Me	26		JRHS:374, 1951. 1942 hybrid.
'Judith'		G-P			Pale pink deeper pink vein.
'Juliet'		S-Win			P-list: no description.
'Kappa'		G-S	33		JRHS:375, 1951.
'King of the Belgians'	Ch	G-ER&Me&S	23		JRHS:374, 1951; illus. PL:139, 1959. Dawn pink HCC 523/3. Large.
'Kitty'		G-Cl	22		JRHS:373, 1951. ('Lady Rankin' x 'Mrs. Shelley') x 'Mrs. Praed'. Salmon.
'Knight Errant'		G-P			P-list: bright rose crimson.
'Knight Templar'		G-ER&Me			
'Lady Ackland'		S-Win			RHSDS:52, 1956. Rose amethyst, robust grower.
'Lady Bromley'	El			AM, El, 1897	Scarlet with slate colored median band.
'Lady Clementina Mitford'	El	G-Cl	22	AM, El, 1898	JRHS:373, 1951. Shell pink suffused with rose.
'Lady de Walden'		G-Cl	22		JRHS:373, 1951. Free flowering.
'Lady Dorington'	El		22	AM, El, 1897	JRHS:371, 1951. Large pink striped rosy purple.
'Lady Downe'		G-Cl	22		JRHS:373, 1951.
'Lady Ffolkes'	El	G-P		AM, El, 1904	Rich bright clear pink, dwarf grower.

NAME	HYBRID-IZER	G=GROWER S=SUPPLIER	2n	AWARD	PUBLICATION, DESCRIPTION AND CROSS
'Lady Foster'					M:187, n.d. (Before 1941) JRHS:370, 1951. ♂ parent of 'Inchmery Kate'?
'Lady Houlkes'		G-Cl	22		JRHS:373, 1951.
'Lady Lawrence'	El			AM, El, 1897	Moderate size orange and salmon.
'Lady Llewellyn'	El	G-Cl	33	AM, El, 1897	JRHS:375, 1951. Blush white with pink centers. Large flower.
'Lady Loder'					JRHS:375, 1951. Parent of 'Dunkirk'.
'Lady Louisa Longley'	El			AM, El, 1900	Salmon pink striped rosy crimson.
'Lady Lucy Hicks Beach'	El	G-Cl	22	AM, El, 1897	JRHS:373, 1951. Rose crimson, large umbel.
'Lady Mary Shelley'	El	G-P	22	AM, El, 1897	JRHS:371, 1951. Vigorous pale pink and salmon.
'Lady Montague'		G-Cl	22		JRHS:373, 1951.
'Lady Rankin'					JRHS:373, 1951. In the background of 'Kitty'.
'Lady Stanley'		G-Cl	22		JRHS:373, 1951.
'Lady Stirling Maxwell'	El	G-Cl	33		JRHS:375, 1951. Among the earliest triploids. 1897.
'Leo'	ER	G-ER&Me			Red.
'Liberty'					
'Lighthouse'		S-Win			RHSDS:52, 1956. Coral with deeper stripe.
'Lillian'		G-P			P-list; no description.
'Lionel'	ER	G-ER&Me	24	AM, ER, 1947	JRHS:374, 1951. Vermilion HCC 18/-. Originally called 'Oriflamme'?
'Lizzie Moore'					RHSDS:52, 1956. Satiny rose with crimson bar.
'Lord Grenfell'		G-S, S-Wa	22		JRHS:373, 1951.
'Lucifer'		G-P			RHSDS:52, 1956. Deep crimson scarlet.
'Lydia'		G-P			P-list: pink waved tepalsegs.
x **magnifica**		G-Or, S-Ho			Pinker and larger than N. **bowdenii.**
x **mansellii**	M	G-Me&P	22(24)	FCC, M, 1887	N vol.4:573, 1888; H:115, 1941. **N. flexuosa** x **curvifolia.** Late rose.
'Margaret'	Me	G-Me			Pink with deeper centers.
'Marie Antoinette'	ER	G-ER&Me			Pale salmon orange.
'Marie Louise'					JRHS:258, 1946. Shell pink with deeper markings.
'Mariloo'	ER	G-ER		AM, ER, 1954	French Rose HCC 520/-. 'Aerolite' x 'Lionel'.
'Mary'	Cl	G-Cl	22		JRHS:373, 1951. 'Countess of Altamont' x 'Mrs. Praed'
'Mary Alice'	Me	G-Me			Good cerise.
'Maryclaire'		G-ER&Me			Scarlet HCC 19/1 striped HCC 19/3.
'Mascote'				AM, B, 1920	Crimson scarlet with central band of scarlet.
x **meadowbankii**		G-Cl	22		NS:552, 1901; JRHS:373, 1951. **N. fothergillii** x **sarniensis.** Orange scarlet.
'Minerva'					H:229; illus. pl.82, 1937. RHSDS:52, 1956. Salmon scarlet, gold dusted.
'Miranda'		G-P			RHSDS:52, 1956. Rich cerise, strong grower.
'Miss Carrington'	El?	G-Cl	22	AM, El, 1902	JRHS:373, 1951. Rose with red median band.
'Miss Cecily Elwes'	B?			AM, B, 1919	Mauve with broad carmine stripe.
'Miss E. Cator'	El	G-Cl		AM, El, 1924	Large rose cerise.

NAME	HYBRID-IZER	G=GROWER S=SUPPLIER	2n	AWARD	PUBLICATION, DESCRIPTION AND CROSS
'Miss Frances Clarke'		G-Cl	22		JRHS:373, 1951.
'Miss Jekyll'	El			AM, El, 1898	Large rosy salmon.
'Miss Norton'		G-Cl	22		JRHS:373, 1951.
'Miss Rosamond Elwes'		G-Cl	22		JRHS:373, 1951.
'Miss Sheepshanks'	Cl	G-Cl	22		JRHS:373, 1951. 'Countess of Altamont' x 'Mrs. Clarke'.
'Miss Shelley'	El	G-Cl	22	AM, El, 1904	JRHS:373, 1951. Handsome pale pink.
'Miss Willmott'	El	G-Cl	22	AM, El, 1899	JRHS:373, 1951. Large orange scarlet.
'Miss Woolward'	Be?			AM, Be, 1903	Rose pink, broad tepalsegs.
'Mrs. A. Eoden'		G-Cl	22		JRHS:374, 1951.
'Mrs. Aimes'		C-Cl	26		JRHS:374, 1951.
'Mrs. Arthur Elwes'	El			AM, El, 1924	JRHS:258, 1946. Shell pink, thin flowers. JRHS:iii, 1946. Exhibited flowers showed virus break.
'Mrs. Bazley'					JRHS:373, 1951. Pale orange salmon.
'Mrs. Berkeley'	El	G-Cl	22	AM, El, 1899	JRHS:374, 1951. White tinted carmine at base.
'Mrs. Clarke'	Cl?	G-Cl			JRHS:374, 1951.
'Mrs. Cooper'		G-Cl	22		
'Mrs. Dent Brokenhurst'		G-Cl	22		JRHS:374, 1951.
'Mrs. Douglas'	El			AM, El, 1898	Large salmon with undulating telapsegs.
'Mrs. Elliott'	El			AM, El, 1901	Sturdy, broad salmon red tepalsegs.
'Mrs. F. R. S. Balfour'	El			AM, El, 1911	Rose pink to white at base.
'Mrs. George Barr'			28		H:115, 1941; JRHS:374, 1951.
'Mrs. Godman'	El			AM, El, 1899	Large bright rose, suffused magenta.
'Mrs. H. J. Elwes'	B	G-ER&Me&P	22	FCC, B, 1919	JRHS:258, 1946 & JRHS:374, 1951. Shell pink.
'Mrs. J. W. Barr'					M:187, n.d. (Before 1941). Soft salmon pink.
'Mrs. Kingscote'		G-Cl	22		JRHS:374, 1951.
'Mrs. Meade Waldo'	El			AM, El, 1911	Large lustrous orange scarlet.
'Mrs. Miller Mundy'	Cl	G-Cl	22		JRHS:374, 1951. 'Countess of Altamont' x 'Mrs. Clarke'.
'Mrs. Moore' (also Miss Moore'?)			22	AM, Be, 1903	JRHS:373, 1951. Rosy crimson, tall scape.
'Mrs. Newman'					JRHS:xxiii, 1935. Exhibited by Dame Alice Godman.
'Mrs. Praed'					JRHS:373 & 374, 1951. Parent of 'Kitty' and 'Peggy'.
'Mrs. Ruthe'		S-Win			
'Mrs. Shelley' (Same as 'Lady Mary Shelley'?)					JRHS:373, 1951. In parentage of 'Kitty'.
x **mitchamiae**					RHSDS:271, 1956. **N. sarniensis** x **undulata.**
'Montreuil'		G-S	22		JRHS:373, 1951.
'Moscow'	LR		22		JRHS:258, 1946 & 373, 1951. Good white hybrid of 1941.
'Motley'					JRHS:125, 1956. Used in unnamed cross with **N. bowdenii.**

NAME	HYBRID-IZER	G=GROWER S=SUPPLIER	2n	AWARD	PUBLICATION, DESCRIPTION AND CROSS
x **mutabilis**					NS:552, 1901. **N. flexuosa** x **humilis;** *syn.* x **excellens.**
'Myra'	S-Win				
'Naomi'	ER	G-ER		AM, ER, 1955	Clear pale salmon. 'Aerolite' x 'Lionel'.
'Nautilus'		G-ER&Me			JRHS:258, 1946. Striped mauve and purple.
'Near Queen Mary'		G-Cl	22		JRHS:374, 1951.
'Nell Gwynne'	ER	G-ER&Me			Deep salmon.
'Nelson'	ER	G-ER&Me		FCC, ER, 1955	Fuchsia purple and red. 'Aerolite' x 'Lionel'.
'Nena'	Cl?	G-Cl		AM, Cl, 1949	Illus. GC:156, Nov. 5, 1949. Rhodamine pink HCC 527/-. Large .
'Nest Rankin'	El			PC, El, 1934	Bright crimson, narrow tepalsegs.
'Nicola'	H	G-Wi	33		JRHS:375, 1951. 1948 hybrid.
'Norma'	Me	G-Me			Free flowering rose pink and lavender.
'Novelty'	W		22	AM, W, 1896	JRHS:374, 1951. Alleged cross of nerine with agapanthus. Rose.
'Nymph'		G-P			P-list: pure white with pink stripe.
x **o'brienii**	O'B				NS:552, 1901. Carmine to slate. **N. pudica** x **plantii.**
'October David'	ER	G-ER&Me			Dark crimson.
'Odette'		S-Win			
'Olive Archer'		G-Cl		PC, Cl, 1957	JRHS:Pt.2:66, 1957. No description.
'Optimist'		G-ER&Me			Bright scarlet, Capsicum Red HCC 715/-.
'Orangeade'		G-ER&Me			Salmon orange.
'Oriflamme'	ER		22		JRHS:374, 1951. **N. fothergillii major** x 'Aerolite'. 1947 hybrid.
'Othello'	LR	G-Win	22		JRHS:374, 1951. 'Miss Shelley' x 'Mrs. Praed'.
'Pale Pink'		G-ER&Me			Variable pink, sometimes darker.
'Pamela'		G-ER&Me			JRHS:258, 1946. Illus. Pl:141, 1959. Porcelain rose HCC 620/1.
'Pantaloon'		G-ER&Me			JRHS:258, 1946. Mauve and purple striped.
'Paula Knight'	Jo?	G-Jo		AM, Jo, 1958	China rose HCC 024/1. Flowers 3 inches.
'Peggy'		G-Cl	22		JRHS:374, 1951. 'Miss Shelley' x 'Mrs. Praed'.
'Pekin'	ER	G-ER&Me			Deep pink flushed mauve.
'Peru'	ER	G-ER&Me	22		JRHS.374, 1951. Pink flushed mauve.
'Peter Barber'	ER	G-ER&Me			Flame.
'Peter Barr'		G-P			JRHS illus. fig. 97, 1946. Glistening rose pink, gold sheen.
'Pink'		G-Me, S-Win			Rather small dawn pink HCC 523/1 and 523/-.
'Pink Beauty'					RHSDS:53, 1956. Late, bright rose pink **N. bowdenii** hybrid.
'Pink Seedling'		G-ER&Me			
'Pink Triumph'		G-V		AM, V, 1957	Fuchsine pink HCC627/2.
'Pompadour'		G-ER&Me			PL:137, 1959. Wide tepalsegs. Vermilion HCC 18/1.
'Prince of Orange'					M:187, n.d. (Before 1941). Bright orange scarlet.
'Princess Mary'		G-P			P-list: no description.
x **pulchello-humilis**					JRHS:488, 1908-9. Syn. of x **excellens?**
x **pulchello-undulata**					N vol. 2:447, 1885; JRHS:488, 1908-9. Syn. of x **excellens?**
'Pure White'		G-ER&Me			

NAME	HYBRID-IZER	G=GROWER S=SUPPLIER	2n	AWARD	PUBLICATION, DESCRIPTION AND CROSS
'Purple Prince'	E	G-Cl	33	AM, E, 1900	JRHS:375, 1951. Crimson flushed purple.
'Purple Princess'				AM, El, 1907	'Purple Prince' x 'Novelty'. Large light crimson.
'Queen Mary'	Cr?	G-ER&Me&P	33	AM, Cr, 1947	JRHS:375, 1951. Coral pink, flowers 2½ inches across.
'Queen Natalie'		G-P			P-list; no description.
'Queen of Sheba'	ER	G-ER&Me			Pale rose pink.
'Queen of the Belgians'					ER has unnamed cross with 'Aerolite'.
'Rachel'		G-ER		PC, ER, 1953	JRHS:10, 1954. No description.
'R. B. Whitehead'		G-Cl	22		JRHS:374, 1951.
'Red Hussar'		G-P			P-list; large salmon scarlet, gold dusted.
'Red Knight'		G-ER?			ER has unnamed cross with 'Aerolite'.
'Robert Berkeley'		G-P			P-list. RHSDS:53, 1956. Rich salmon rose, shot gold.
'Rodacea'	ER	G-ER&Me			Salmon orange.
'Romeo'		S-Win			
'Ronald'		G-P			P-list; deep coral red with deeper red stripe.
'Rosalba'	ER	G-ER&Me			White, pale pink edge.
'Rosebud'	B?			AM, B, 1915	Attractive dark rose, lighter at base.
'Rosella'		G-P			P-list; bright rose pink, reflexing tepalsegs.
'Rosemary'	ER	G-ER&Me			White flushed pink.
x roseo-crispa		S-Ho			NS:552, 1901. **N. flexuosa** x **undulata.**
'Rose Parade'	Me	G-Me			Azalea pink HCC 618/-.
'Rosinante'	ER	G-ER&Me		AM, ER, 1953	Deep porcelain rose. 'Aerolite' x 'Lionel'.
'Rosy Dawn'	Me	G-Me			Beautiful salmon pink.
'Rotherside'	Ch	G-ER&Me	33	AM, Ch, 1916	JRHS:375, 1951. Signal red HCC 719/-. **N. corusca** x **Fothergillii.** Fine.
'Roweana'		G-P			P-list; coral red with deep crimson star.
'Royal Dragoon'		G-P			P-list; deep rose crimson, gold dusted.
'Royal Prince'		G-P			P-list; scarlet, shot purple.
'Roza Stevenson'	ER	G-ER&Me		AM, ER, 1955	French rose HCC 520/2. 'Caryatid' x 'Alice'.
'Ruffles'	Me	G-Me			Pale pink, much crisped.
'Ruth'	ER	G-ER&Me			Deep pink.
'Salmon'		G-ER&Me, S-Win			
'Salmon Perfection'		G-P			P-list; clear light salmon, strong tall grower.
'Salmon Pink'		G-ER&Me			Deep crimson pink.
'Salmon Queen'				AM, El, 1913	Reddish salmon, tall scape.
'Salmon Trout'		G-ER&Me		AM, ER, 1955	Azalea Pink HCC 618/1, deeper vermilion stripe.
'Salmone'		G-ER&Me			Salmon, narrow tepalsegs.
'Santa Anita'	Me	G-Me			Bright carmine, lighter centers, crisped.
'Scarlet Beauty'					M:186, n.d. (Before 1941). Brilliant orange scarlet.
'Scarlet Gem'	Me	G-Me			Fine scarlet.
'Scarletta'					RHSDS:53, 1956. Rich rose scarlet, gold dusted.
'Scintilla'					RHSDS:53, 1956. Large glowing crimson scarlet and purple.

NAME	HYBRID-IZER	G=GROWER S=SUPPLIER	2n	AWARD	PUBLICATION, DESCRIPTION AND CROSS
'Sea Shell'	Me	G-Me			Bright shell pink.
'Sequin'	Me	G-Me			PL:140, 1959. Carmine rose HCC 621/2, silver dusted.
'Sharon'	Me	G-Me			PL:140, 1959; illus.:141, 1959. Salmon pink with lighter edges.
'Shell Pink'		G-ER&Me			Deep pink, narrow tepalsegs.
'Sieglinde'		G-P			P-list; tall glistening satiny pink.
'Snow'	ER	G-ER&Me			White.
'Snowdrift'					JRHS:258, 1946. Good white.
'Snowflake'	El	G-ER&Me	22	AM, El, 1911	JRHS:374, 1951. Pure white, medium size.
'Solent Swan'		G-ER&Me			Illus. PL:139, 1959. Fine pure white except pink stamens.
'South Saxon'				PC, Cr, 1934	Bright cerise, broad crisped tepalsegs.
'Sparkler'					RHSDS:53, 1956. Deep rose, gold dusted.
'Sparta'		G-ER&Me			Porcelain rose HCC 620/-.
'Spitfire'		G-ER&Me			Very fine rose crimson.
x **spofforthiae**					RHSDS:271, 1956. **N. sarniensis** x **undulata.**
'Stella'		S-Win			
'Stephanie'	Cl?	G-Cl&ER&Me	22	AM, Cl, 1949	JRHS:374, 1951. Rhodamine pink HCC 527/2, large flowers.
x **stricklandii**					NS:522, 1901. **N. sarniensis** x **pudica.**
'Sugarstick'		S-Win			
'Susan'	ER	G-ER&Me		AM, ER, 1954	Illus. PL:141, 1959. Very fine porcelain rose HCC 620/2.
'Talisman'		G-P			P-list; salmon scarlet, gold dusted.
x **tardiflora**					NS:552, 1901. Old cross confused with **N. flexuosa.**
'Thalia'		G-P			P-list; deep salmon pink, gold dusted.
'Theresa'	ER	G-ER&Me			Salmon, flushed mauve.
'Tonga'	ER	G-ER&Me			Deep mauve.
'Trafalgar'	ER	G-ER&Me		AM, ER, 1952	Fine carmine. 'Aerolite' x 'Lionel'.
'Ultra Violet'	Me	G-Me			Bright rose and blue.
'Unique'	ER	G-ER&Me			Pink flushed mauve.
'Vampire'	ER	G-ER&Me		AM, ER, 1953	Turkey red HCC 721/3. 'Aerolite' x 'Lionel'.
x **versicolor**					RHSDS:271, 1956. **N. sarniensis** x **undulata.**
'Vivid'		G-ER&Me		AM, B, 1915	Deep scarlet red.
'Vivien'		G-Cl	22		JRHS:373, 1951. ('Lady Rankin' x 'Mrs. Shelley') x 'Mrs. Praed'.
'Wales'	J	G-Wi		AM, J, 1927	Rich orange red, long wide tepalsegs.
'Waterloo'		G-ER&Me		PC, ER, 1952	JRHS:14, (Extracts) 1953. No description.
'Wellington Koo'		G-ER&Me			
'White'		G-ER&Me			PL:140, 1959. White with tinge of pink.
'White Knight'				AM, B, 1923	Large white with pink median stripe.
'Wisley Bridesmaid'		G-ER&Me			PL:140, 1959. Porcelain rose HCC 620/2.
'Zanzibar'	Me	G-Me			Fine brilliant cerise.
'Zoroaster'					BS:2138, 1935. **N. pudica** x **sarniensis.**

[CATALOG, NERINE CLONES, ABBREVIATIONS, continued from page 64.]

OTHER ABBREVIATIONS

PC — Preliminary Commendation, Royal Horticultural Society award.

AM — Award of Merit, Royal Horticultural Society award.

FCC — First Class Certificate, Royal Horticultural Society award.

2n — Somatic chromosome number. All counts referred to JRHS 1951 are by E. K. Janaki Ammal and Margery Bridgewater, except 'Chameleon', x *mansellii*, x *elegantissima*, 'Mrs. George Barr' and 'Ingens' which are also by W. M James and F. T. Addicott in Herbertia 1941.

[PLANT LIFE LIBRARY, continued from page 178.]

THE GARDEN FLOWERS OF CHINA, by H. L. Li. Ronald Press Co., 15 E. 26th St., New York 10, N. Y. 1959. pp. 240. illus. $6.00. This charming and beautifully illustrated book by an outstanding Chinese botanist explains why China is called the mother of gardens. Going back to the original Chinese sources, the history of each plant treated is detailed, including scientifically established facts as well as the legendary tales. This book is highly recommended to orientalists and gardeners generally.

ORCHIDS IN AUSTRALIA, by Fred Moulen. Charles T. Branford Co., 69 Union St., Newton Centre 59, Mass. 1959. pp. 148, including 100 color illustrations. $15.00. This delightful volume contains a selection of 100 excellent color plates of Orchids cultivated in Australia, based on 35 mm. color transparencies made by the author, who has had years of experience in his chosen field. The selections include Cymbidiums, Cattleyas, Vandas, Cypripediums, Dendrobiums, Miltonias, and so on. This fine contribution to Orchid lore is recommended to all who are interested in these interesting and beautiful plants.

PLANTS AND ENVIRONMENT, 2nd. ed., by R. F. Daubenmire. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1959. pp. 442. illus. $6.75. This second edition, subtitled a textbook of plant autecology, by an outstanding authority, will be welcomed by all students of plant science. The subjects treated include the soil, water, temperature, light, atmospheric, biotic and fire factors, followed by the consideration of the environmental complex, and ecologic adaptation and evolution. Some of the new subjects included are—the evaluation of stoniness of soils, significance of dew to plants, new concepts of evapotranspiration, shielding of precipitation gauges, urban microclimate, frost-churning of soil, and atmospheric pollution by smog and hydrogen fluoride. This stimulating textbook is highly recommended.

PERSPECTIVES IN VIROLOGY, edited by Morris Pollard. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1959. pp. 312. illus. $7.00. The objective of this symposium volume, dedicated to F. R. Beaudette (1897-1957), is to explore the implications of basic contributions to virology for public health applications. It includes papers by twenty authorities, and extemporaneous discussions of these papers by forty-five leading American and European virologists. This stimulating book is required reading for students of virology, and those who are interested in preventive medicine and public health. An epilogue on Tulipomania in 17th century Holland, and the benevolent virus is of special interest to plant scientists and gardeners.

BIOPHYSICAL SCIENCE—A STUDY PROGRAM, planned and edited by J. L. Oncley et al. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1959. pp. 568+ indices. $6.50. This comprehensive study program in biophysical science is based on the carefully integrated series of papers by sixty-one authorities who contribute compact summaries of certain key problems and critical evaluations of

[PLANT LIFE LIBRARY, continued on page 158.]

REGISTRATION OF NEW AMARYLLIS CLONES

Registrar: Mr. W. D. Morton, Jr.

This department has been included since 1934 to provide a place for the registration of names of cultivated *Amaryllis* and other amaryllids. The procedure is in harmony with the INTERNATIONAL CODE OF BOTANICAL NOMENCLATURE (edition publ. 1956) and the INTERNATIONAL CODE OF NOMENCLATURE FOR CULTIVATED PLANTS (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893-1948" by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $2.50 prepaid from: Dr. Thos. W. Whitaker, Executive Secy, THE AMERICAN PLANT LIFE SOCIETY, Box 150, La Jolla, Calif. CATALOG OF HYBRID NERINE CLONES, 1882-1958, by Emma D. Menninger; and CATALOG OF BRUNSVIGIA CULTIVARS, 1783—1959, by Hamilton P. Traub and L. S. Hannibal, are published in the present (1960) issue of the AMARYLLIS YEAR BOOK. A catalog of Amaryllis names, and also a catalog of the names of other cultivated amaryllids, is scheduled for publication in 1961 HERBERTIA.

Only registered clones of Amaryllis and other amaryllids are eligible for awards and honors of the AMERICAN AMARYLLIS SOCIETY. Numbers of registered clones are preceded by a prefix, an abbreviation for the genus concerned. Thus, A-390, the "A" standing for *Amaryllis*; Z-1, the "Z" standing for ZEPHYRANTHES, etc.

Correspondence regarding registration of all amaryllis such as *Amaryllis*, *Lycoris*, *Brunsvigia*, *Clivia*, *Crinum*, *Hymenocallis*, and so on, should be addressed to: Mr. W. D. Morton, Jr., Registrar, 3114 State Street Drive, New Orleans 25, Louisiana. The registration fee is $2.00 for each clone to be registered. Make checks payable to AMERICAN PLANT LIFE SOCIETY.

HYBRID **AMARYLLIS** CLONES

Introduced by Mrs. H. L. Harris, 3645 South Saxet Drive, Corpus Christi, Texas:

'Fan Tan' (Harris, 1959), reg. no. A-549, 7-1-59. D-5a (Leopoldii). Basic color is signal red (HCC-719), each seg has ½" white stripe extending 2/3" from throat to ¾ the length of each seg. forming a star; deepest part of throat slightly green; stamens and pistil signal red; segs markedly recurved with narrow white border extending around each seg. 22" tall; flower length 3⅞"; size across face, 8"; evergreen; spring blooming; faint fragrance. Parentage: cross between Dutch and American hybrids.

Introduced by Ludwig & Co., Hillegom, Netherlands:

'Circus' (Ludwig, 1959), reg. no. A-538, 6-22-59. D-5a (Leopoldii). Signal red (HCC-719-719/2) with white stripe and white outer edge; scape 28" tall; flower length 3"; size across face 8"; spring blooming.

'Christmas Gift' (Ludwig, 1959), reg. no. A-539, 6-22-59. D-5a (Leopoldii). white with soft green throat; scape 23" tall; flower length 3½"; size across face 8"; spring blooming, but flowers later than all other Ludwig pure white Amaryllis.

'Ludwig's Ace' (Ludwig, 1959), reg. no. A-540, 6-22-59. D-5a (Leopoldii). Pink (HCC-016/1—618 to 618/2), shaded light brick red with delft rose throat; scape 23" tall; flower length 3½"; size across face 8"; spring blooming.

'Prima Donna' (Ludwig, 1959), reg. no. A-541, 6-22-59. D-5a (Leopoldii). Begonia rose (HCC-619) with reflections of azalea pink and darker rosy red throat; scape 28" tall; flower length 3½"; size across face 9"; spring blooming.

'Spring Dream' (Ludwig, 1959), reg. no. A-542, 6-22-59. D-5a (Leopoldii). Delft rose (HCC-020/1); scape 25" tall; flower length 3½"; size across face 8"; spring blooming.

Introduced by Charles Ramelli, 126 Jeff Davis Ave., Biloxi, Miss.:

'Cathedral Windows' (Ramelli, 1960), reg. no. 542, 7-6-59. D-5 (Leopoldii). Brick red (HCC-016) with white, giving the effect of light orange; scape 23" tall; flower length 4"; size across face 6½"; spring blooming; deciduous with foliage at blooming time.

'Dresden Beauty' (Ramelli, 1960), reg. no. 544, 7-6-59. D-4 (Reginae). White with porcelain rose (HCC-620) edging and markings, scape 22" tall; flower length 4½", size across face 6½"; spring blooming; deciduous with foliage at blooming time.

'Fuchsia Rose' (Ramelli, 1960), reg. no. 545, 7-6-59. D-5 (Leopoldii). Fuchsia rose, between Fuchsia purple (HCC-28) and magenta rose (HCC-027); scape 22" tall; flower length 4"; size across face 6½"; spring blooming; deciduous with foliage at blooming time.

'Silver Halo' (Ramelli, 1906), reg. no. 546, 7-6-59. D-5 (Leopoldii). Scarlet (HCC-19) with a white throat shading to greenish in center, and a silver ⅛" halo or picotee edging around the edges of the tepalsegs; scape 22" tall; flower length 3½"; size across face 6½"; spring blooming; deciduous.

'Springsong' (Ramelli, 1960), reg. no. 547, 7-6-59. D-5 (Leopoldii). Oriental red (HCC-819) over white, with white star in throat; scape 22" tall; flower length 3½"; size across face 7½"; spring blooming with foliage at flowering time.

'Tropical Sunset' (Ramelli, 1960), reg. no. 548, 7-6-59. D-5 (Leopoldii). Signal red (HCC-719) with a white throat and cardinal red (HCC-822) spots in deepest part of throat; scape 26" tall; flower length 4"; size across face 7" spring flowering; deciduous with foliage at blooming time.

Introduced by W. S. Warmenhoven (P. J. Komen, Anna Paulowna, Holland):

'Red Majesty' (Warmenhoven, 1955), reg. no. A-550, 9-30-59; introduced 1955. D-5 (Leopoldii). Huge very broad segmented red with frosty sheen; scape 24" tall, flower size across face 10"; spring blooming; foliage with reddish tinge; deciduous. Valleevue 1953 rating AA.

'Red Master' (Warmenhoven, 1950), reg. no. A-551, 9-30-59; introduced 1950. D-5 (Leopoldii). Huge dark red of great substance; scape 24" tall; florets flat, flower size across face 11-12"; spring blooming; deciduous. Rating 1950 Valleevue Trials AA.

'Royal Ruby' (Warmenhoven, 1955), reg. no. A-552, 9-30-59, introduced 1955. D-5 (Leopoldii). Brilliant clear medium red of excellent substance; scape 28" tall; flower size across face 9"; spring blooming; deciduous. Rating 1953 Valleevue trials A.

Introduced by Hamilton P. Traub, La Jolla, Calif.

'Alabaster' (Traub, 1960). Reg. no. A-553, Jan. 1, 1960. Leopoldii D-5a. Plant 22" tall; spring flowering; 4 flowers per umbel, very large pure white, long lasting. Of easy culture outdoors in southern California. Deciduous.

HYBRID BRUNSVIGIA CLONES

Introduced by L. S. Hannibal, Fair Oaks, California:

Brunsvigia x *parkeri* clone 'Spider' (Hannibal, 1960), see Fig. 18. This is a new cultivar resulting from the crossing of *Brunsvigia* x *parkeri alba* and *Brunsvigia rosea* var. *pallida*. Presumably the *B. rosea* strain which J. C. Bidwell used in effecting his hybrids with *B. grandiflora* Lindley was quite distinct from the *pallida* form which is more common to the western side of the Cape. Consequently the crossing of var. *pallida* with Bidwell's hybrids leads to some striking colors and unusual tepalseg forms. To obtain 'Spider', a form of *Brunsvigia* x *parkeri alba* with narrow linear tepalsegs, was chosen as the seed parent and some of the resulting seedling represent the extreme in narrow tepalsegs obtained so far. The throat to the blossom is butter yellow and the open perianth is a soft pink which turns rose in two or three days.

Fig. 18. *Brunsvigia* x *parkeri* clone 'Spider' (Hannibal); segs narrow, linear, throat of flower butter yellow, rest of flower is soft pink changing to rose with age. Photo by L. S. Hannibal.

Brunsvigia x *parkeri* clone 'Hibiscus Queen' (Hannibal, 1960), see Fig. 17. This bulb is of the same general parentage as 'Spider' but the inner tepalsegs are very broad and reflexed to give a flat blossom. The throat and inner portion of the limb are a deep yellow, blending to a soft bronze and pink over the face of the blossom, which gives it the appearance of being a large hibiscus blossom. During mild or cool weather the blossoms take on a much deeper tone of color.

Brunsvigia x *parkeri* clone 'Radiata Queen' (Hannibal, 1960). This cultivar was derived from interbreeding various white *Brunsvigia* x *parkeri* seedlings. The scape carries some 30 or 35 white blossoms on pedicels some six to eight inches in length. The blossoms are shaped like those of *B. grandiflora* Lindley and tend to open together producing a flowering umbel some eighteen inches in diameter. The general overall appearance is that of a white *B. grandiflora*. Contrary to most white hybrids the plant produces copious quantities of seed but few offsets.

Brunsvigia x *parkeri* clone 'Appleblossom' (Hannibal, 1960). This cultivar is a pale pink *picotee* type. The tepalsegs are very elliptical in form and resemble those of a large apple blossom. The parentage probably involves that of the clone 'Grace' or of 'Frank Leach'. The plant produces no seed.

STANDARD ABBREVIATIONS FOR TREES, SHRUBS AND HERBS FOR AN IBM MECHANIZATION PROGRAM

In connection with the above subject, W. M. Marshall, Engineer of Administrative Service, Division of Highways, State Office Bldg., Springfield, Ill., writes as follows: "We are endeavoring to convert relevant material into an IBM mechanization program. Acceptable abbreviations are imperative to this program. We have thus far been unsuccessful in our attempts to locate any course material of this variety."

Anyone who is able to offer constructive suggestions should write directly to Mr. Marshall.

[**CORRIGENDA, PLANT LIFE, VOL. 15. 1959,** continued from page 4.]

"The name, *Cooperia oberwetteri* (err. *C. oberwetti*) is a *nomen subnudum*, without a type specimen. It is supported only by the phrase, "In *C. oberwetti* the foliage is narrower than *C. drummondii* and has less bloom." This is insufficient as a diagnosis. A more detailed description and a type specimen would now be needed to validate the name. Since one can only speculate as to the true identity of the original plant—as has been done here in connection with a hybrid—validation at this late date is not possible. Apparently Lancaster's father obtained the plant from P. H. Oberwetter of Texas, and labeled it with the sender's name without formally proposing it. The reference to it is incidental to the discussion of the hybrids."

Page 39, last line, bottom of page, for "Smith" read "Jones".

Page 70, 12th line, for "tetroploids" read "tetraploids".

Page 72, last paragraph, 2nd line, change "*lilioasphodelus* var *rosea* (Stout) Traub* to "*fulva* var. *rosea* Stout."

bottom of page, delete entire footnote beginning "**Hemerocallis lilioasphodelus* etc. . . ."

Page 73, caption, Fig. 9, 2nd line, change "*lilioasphodelus*" to "*fulva*".

Page 150, 13th line from bottom, for "*iamesonii*" read "*jamesonii*".

CORRIGENDA

THE AMARYLLIS MANUAL, BY HAMILTON P. TRAUB. MACMILLAN CO. 1958.

Page 10, 1st paragraph, 5th & 6th lines; and page 278, 17th line from bottom, Delete "Prince's Island in the estuary of the Congo River", and substitute "Principe Island".

CYTOLOGICAL INVESTIGATIONS IN THE GENUS **LYCORIS.** 4. CHROMOSOME NUMBER AND KARYOTYPES IN **LYCORIS AUREA, "L. SPERRYI,"** **L. ALBIFLORA** and **L. ELSIAE**

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INTRODUCTION

Because of the recent introduction of several undescribed *Lycoris* taxa into the United States, karyotype analyses and a consideration of phylogenetic relationships among the known and unknown species in this genus has taken on a new importance. Taxonomically, much care and attention has been given by Traub (1957; 1958) to new species in this genus and as a result the total number of *Lycoris* species presently listed is seventeen. Attempts to cross different species of *Lycoris* have also been started rather extensively by Caldwell (1958), who has re-reported reciprocal crosses involving seven species. In the present paper the author describes the chromosome number and morphology of three species of *Lycoris*, belonging to subgenus LYCORIS (Traub, 1958) and also of one undescribed species designated as "L. sperryi" native to the hillsides and mountains between Huchow and Hangchow in Checkiang Province, China (Caldwell, 1958).

MATERIALS AND METHODS

Table 1 lists the plant material used in this investigation, together with their source and accession numbers.

Table 1

Source and accession numbers of **Lycoris** taxa

Taxa	Source	Accession number
aurea	H. P. Traub, La Jolla, California	14069-57
"sperryi"	S. Caldwell, Nashville, Tennessee	14382-58
albiflora	W. Hayward, Orlando, Florida	13104-55
elsiae	S. Caldwell, Nashville, Tennessee	14381-58

In order to get maximum scattering of chromosomes in the metaphase divisions of the root tip cells, two chemicals were tried as pretreatment fluids (Table 2).

Table 2. Chemicals used as pretreatment fluids and their use

Chemicals	Concentration	Hours of treatment	Temperature
8-Hydroxyquinoline	0.002 mol/1	4	10-15°C
Colchicine	0.2 per cent	4	20-26°C

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After pretreatment the root tips were rinsed in water and were then fixed in acetic acid: alcohol, 1:3 for 24 hours. Following fixation, root tips were hydrolyzed in 10 per cent HCl for 12-15 minutes at 58°-60°C. They were then rinsed and placed in Feulgen staining solution for from 15 to 30 minutes and the brightly stained tips smeared in a drop of 45 per cent acetic acid in the usual way.

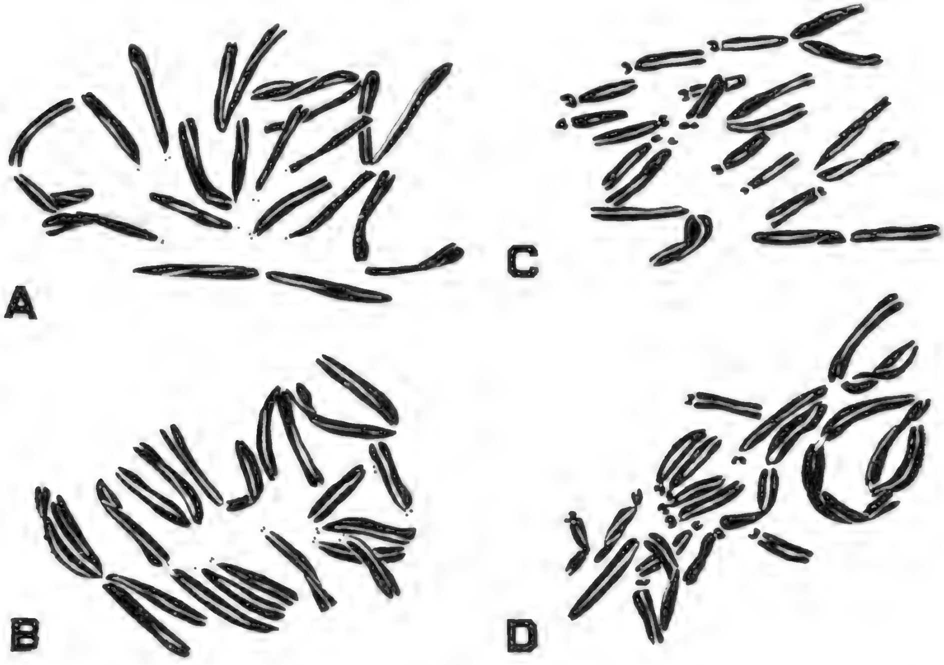

Figure 19. Somatic metaphase polar views of *Lycoris* taxa spaced for clarity and drawn at x2500. 19-A and 19-C had the chromosomes spread by pretreatment with 0.002 mol 1, 8-Hydroxyquinoline. 19-B and 19-D had chromosomes spread by pretreatment with 0.2 per cent Colchicine. A. *Lycoris aurea*, 2n=15. Chromosome types A, B and D. B. "*L. sperryi*", 2n=15. Chromosome types A, B and D. C. *L. albiflora*, 2n=17. Chromosome types A, B and C. D. *L. elsiae*, 2n=17. Chromosome types A, B and C. Drawn at x2500 and reduced to x1125 in reproduction.

The same chromosome type designations are used as in previous papers (Bose 1958a; 1958b; 1958c). These types are:—A, B, C, D, E and their sub-types.

Drawings were made with a camera lucida using a 1.25 N. A. objective (x90) with a compensating eye piece (x15) giving a magnification at table level of approximately x2500.

OBSERVATIONS

On the basis of the present study the chromosome complement can be classified into the following types:—

Type A:—Chromosomes with median primary constrictions.
Type B:—Chromosomes with submedian primary constrictions.
Type C:—Chromosomes with subterminal primary constrictions.
Type D:—Chromosomes with nearly terminal centromeres and a dot like shorter arm.

The bulbs of *Lycoris aurea* used in the present study have a somatic chromosome number of 15. Since previous numbers known for this species have been 2n=12 and 2n=13 and 14, this means that a new chromosome race has been dealt with here. In the complement of this 2n=15 *L. aurea* chromosome types A, B and D have been seen to occur (Fig. 19-A).

In "L. sperryi" a somatic chromosome number of 15 is found. Here also, the types A, B and D occur and in general, the chromosome morphology is similar to that found in the 2n=15 chromosome race of *L. aurea* (Fig. 19-B).

The somatic chromosome numbers in *L. albiflora* and in *L. elsiae* are found to be 2n=17. In each species, A, B and C types occur, and hence these two species are similar cytologically (Figs. 19-C&D). One characteristic feature of the karyotypes of these two taxa is the presence in each of the type C-chromosomes with subterminal primary constrictions.

A comparison of the measurement of the chromosomes of the four taxa was not attempted as they were pretreated with different chemicals.

DISCUSSION

Similarities in chromosome number and morphology were reported previously between *L. aurea* and *L. traubii* (Bose, 1958a). In the present investigation a new chromosome race in *L. aurea* with a somatic number of 15 has been found to be identical in chromosome number and morphology with that of an undescribed taxon—"L. sperryi." A newly described species—*L. elsiae* (Traub, 1958), with a 2n number of 17 has shown similarity with *L. albiflora* in its chromosome number and karyotype (Figs. 19-C&D).

Gene mutation would seem to be the chief factor in the differentiation of these species. The cytological evidence would suggest *L. albiflora* and *L. elsiae* to be very closely related. According to the taxonomic classification of Traub (1958), the closest relative to *L. elsiae* is *L. houdyshelii* on the basis of its having a loosely arranged umbel and medium or dark green leaves, while in *L. albiflora* the umbel is tightly packed and the leaves are medium green in color. In this classification, *L. albiflora, L. houdyshelii* and *L. elsiae* all belong to the same section of the subgenus Lycoris, and they are placed here for their distinctly irregular perigones and for having leaves which show lighter stripes or bands in the center. On cytological grounds, *L. elsiae* seems far removed from *L. houdyshelii*—a species with not only a different chromosome number—2n=30, but which is also quite different in its chromosome morphology (Bose, 1957; 1958c).

Inariyama (1951) suggested the natural hybrid origin of *L. albiflora*. He believed that a cross between *L. radiata* var. *pumila* (2n=22)

and *L. aurea* (2n=12) gave rise to *L. albiflora* with 5V and 12 rod chromosomes. As evidence for this assumption he mentions the morphological and karyological similarities that a hybrid of *L. radiata* var. *pumila* by *L. aurea* might be expected to have with that of *L. albiflora.* He also obtained F_1 plants from a cross between *L. aurea* (2n=14) and *L. radiata* var. *pumila* (2n=22). However, he did not attempt cytological investigations of the F_1 seedlings because of their immaturity. The above discussion would suggest that the origin of *L. albiflora* by hybridization between *L. aurea* with 8V and 6 rods and *L. radiata* with 22 rods must take into consideration the addition of two V chromosomes and the loss of four rod chromosomes, in order to give rise to *L. albiflora* with 5V and 12 rods. Any explanation accounting for the origin of *L. albiflora* would seem to possibly apply to the origin of *L. elsiae*, also.

Chromosome numbers and morphology are known for thirteen species and one undescribed taxon of *Lycoris.* It is evident from this data that the present state of our knowledge regarding the karyotype evolution in *Lycoris* indicates, either that fusion of two rods to form a V; or the fragmentation of a V to form two rods could be taken as the principal mechanism in this genus for the origin of forms with different chromosome numbers of differing morphology (Inariyama, 1951; Bose, 1958c). Speciation and chromosome number variation apparently occurred within the diploid and triploid groups in *Lycoris* without the additions of extra chromosomal elements or materials. The finding of different chromosome races within the same species suggestively indicates a pattern of karyotype evolution in *Lycoris* (Bose, 1958c).

SUMMARY

In *Lycoris aurea,* a clone with 2n=15 chromosomes has been found. In *L. albiflora,* the somatic number of 17 has been confirmed, and new numbers of 2n=15 and 2n=17 have been found for "L. sperryi" and *L. elsiae* respectively.

ACKNOWLEDGEMENTS

The author wishes to acknowledge his indebtedness to Dr. W. S. Flory, Jr., for his guidance and criticism during the course of this investigation.

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CYTOLOGICAL INVESTIGATIONS IN **LYCORIS.** 5. CHROMOSOME NUMBER AND KARYOTYPE IN **LYCORIS CHINENSIS**

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INTRODUCTION

In a preliminary study the chromosome number in *Lycoris chinensis* was reported to be 2n=16 (15) (Bose, 1959b). The present work has attempted to determine the exact chromosome number and to analyze the karyotype of this new species described by Dr. Traub in 1958.

MATERIALS AND METHODS

A single bulb of *L. chinensis* was obtained through the courtesy of Dr. J. L. Creech of the United States Plant Introduction Station. Actively growing root tips excised from the potted bulb were pretreated in a saturated solution of paradichlorobenzene for four hours, fixed in acetic acid: alcohol, 1:3, for 24 hours, hydrolysed in 10 per cent HCl for 10-12 minutes and then squashed in a drop of 2 per cent aceto-orcein. Only unbroken cells with well scattered chromosomes were used in making the present observations. As in our previous *Lycoris* studies, all observations have been with somatic figures only.

Drawings were made with a camera lucida using a 1.25 N.A. objective (x90) with compensating eye piece (x15), giving an initial magnification at table level of about x2500.

OBSERVATIONS

The chromosomes in *L. chinensis* are easily recognizable to be either V or rod types (Fig. 20-A), like those found in the other species of *Lycoris* investigated. Chromosome types: A (median primary constriction); B (submedian primary constriction) and D (nearly terminal primary constriction and a dot like shorter arm), can be identified in this material. It might be mentioned here, that the karyotypes of *L. aurea*, *L. traubii* (Bose, 1959a) and *L.* "sperryi" (Bose, 1960) are all composed of chromosomes of these three types only. In addition to these, a new type of chromosome unlike any found in the species of *Lycoris* previously studied is reognized in *L. chinensis*. This chromosome is being designated as "small v" (nearly submedian constriction) be-

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cause of its shape and size (Fig. 20-A). This small v. chromosome always occurred singly in all the metaphase stages. In a single anaphase stage two chromosomes of this type were observed at one pole and one of the same type at the opposite pole (Fig. 20-B). No explanation of this occurrence can be made at this time. The distribution of chromosomes in this anaphase figure may be represented as follows:—

2n=16: 6V+2v+8R
2n=16: 6V+1v+9R

In metaphase stages the distribution was always observed to be 6V+1v+9R with a total of 2n=16 (Fig. 20-A).

In one doubtful case, a karyotype with 7V+1v+7R was found, suggesting a somatic number of 2n=15.

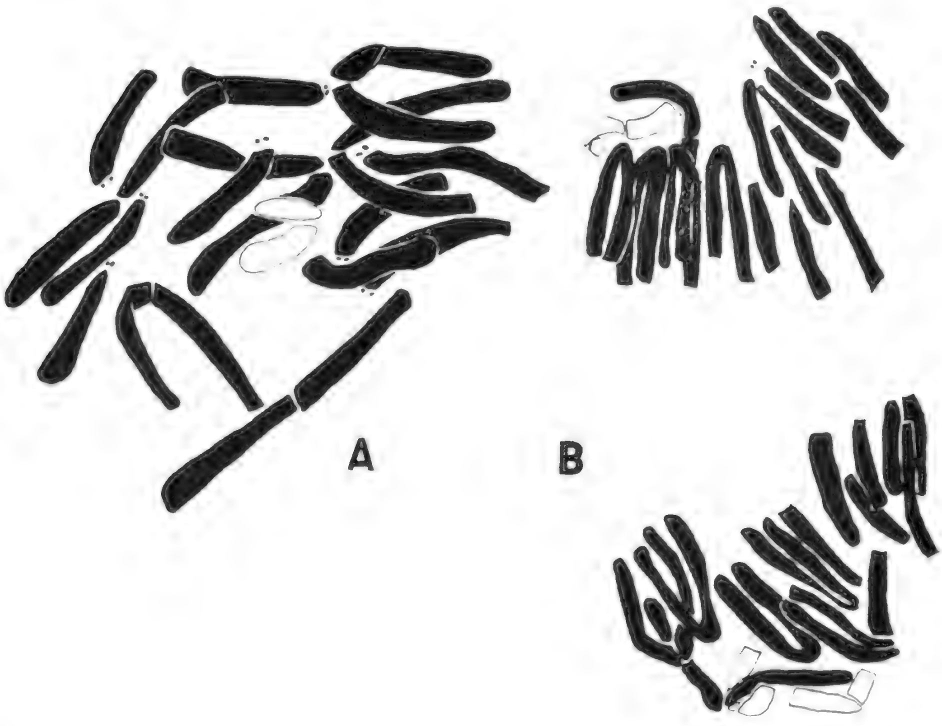

Figure 20. Somatic chromosomes of *Lycoris chinensis*, 2n=16. Chromosome types A, B, D and "small v" (drawn in outline) seen. Spread by pretreatment with paradichlorobenzene for four hours; drawn at x2500 and reduced to x1525 in reproduction

A. Somatic metaphase of *Lycoris chinensis*, 2n=16. Chromosome types A, B, D and one "small v" (drawn in outline) seen.

B. Somatic anaphase of *L. chinensis*, 2n=16. The distribution of chromosome types are as follows: Lower pole 2n=16: 6V+8R+2v (drawn in outline). Upper pole—2n=16: 6V+9R+1v (drawn in outline).

DISCUSSION

The finding of the new type of chromosome—a small v-shaped one with a nearly submedian constriction—suggests the role of translocation or inversion in the origin of this type. It may be pointed out again that in no other species of *Lycoris,* studied thus far, has this type of chromosome been observed.

In one doubtful case, where 7 V chromosomes seemed apparent, the possibility that this might be a true condition, with one of the V's usually fragmenting across the centromere (perhaps due to the weakness of the centromeric region of one of the chromosomes) to give rise to two rods, could not be considered as likely because of the otherwise constant occurrence of 6 V's, even with very light pressure during squashing. In the future additional material of *L. chinensis* will be studied following pretreatments of root tips with different chemicals, in an effort to determine whether the effects of such chemicals—or perhaps an inherent genetic weakness of the centromere—may possibly cause some V's to break easily under slight pressure during squashing.

Lycoris straminea is the only other species reported to have 16 somatic chromosomes (Inariyama, 1951). In this species 6 V's and 10 rod chromosomes are found in somatic cells. According to Traub's (1958) classification, *L. straminea* and *L. chinensis* occur in the same subgenus *Lycoris* of the genus *Lycoris.*

One can speculate on the possibility of the *L. chinensis* chromosome complement originating from that of *L. straminea* by one single change—a pericentric inversion of one of the rod chromosomes of the latter. Or contrarily, (but seemingly more unlikely), perhaps by such an inversion of the small v of *L. chinensis* to give rise to another rod in the *L. straminea* complement. Neither possibility seems very likely, since there are flower color and other differences in the two species, and if such an inversion was responsible for the differences in the two taxa there would still be essentially the same genic structure. A different arrangement of the genes would occur in chromosomes with such inversions, of course.

SUMMARY

The somatic chromosome number in a recently described species, *Lycoris chinensis* Traub, is reported to be 16. The chromosome complement is composed of 6 V's, 9 rods and a single "small v" chromosome. The latter, has a nearly submedian centromere. This small v type is new to the genus, not having been observed in any other species of *Lycoris* studied so far.

ACKNOWLEDGEMENTS

The author wishes to express his indebtedness to Dr. W. S. Flory, Jr., for his guidance and criticism during the course of this investigation.

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THE **ZEPHYRANTHES CLINTIAE** COMPLEX. I. INITIAL REPORT ON THE SOMATIC CHROMOSOMES

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Zephyranthes clintiae Traub (1952) is part of a variable complex brought to attention by the recent collection of Mr. and Mrs. Morris Clint (1952; 1957). A biosystematic investigation is underway in an attempt to determine the source of variability in *Z. clintiae* and the relationship of the complex to other Mexican species of *Zephyranthes*.

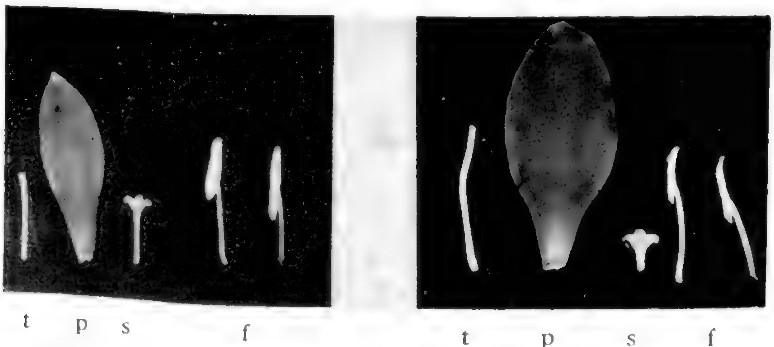

Figure 21. Flower parts of *Zephyranthes clintiae* (M-283) (natural size): t—tepaltube length represented by included style; p—petseg; s—style and stigma excerted beyond tepaltube; f—stamens, petaline filament next to stigma and sepaline filament on the outside.

Although this is primarily a cytological report, the extreme variation in the complex dictates a concomitant description of gross morphology.

MATERIAL: **Zephyranthes clintiae**, M-283

Mrs. Clint sent W. S. Flory 12 bulbs (Clint No. M-283, B. E. F. No. 14163-57) from a large group of seedlings raised from seed collected near K 280 on Mexican Route 80 in the state of San Luis Potosi. Mrs. Clint (1959) writes, "This form may have a wider range over the mountains than we have so far found, but we have always collected them in the same place, give or take a few tenths of a mile. So this places them on the [western] edge of a seasonable wet, forested part of the

mountains. . . . rainfall is beginning to decrease [as one goes west], so neither the trees nor the vegetation is quite so thick, yet still pretty jungly in the wet season. Most of the soil in this area is a porous red clay loam, but there are spots where the red color is absent and M-283 is found in one of these spots, in rather stony soil or among heavy rocks in pockets. The ground and rock crevices are usually covered with leaf mold."

Regardless of the considerable range (Fig. 21) shown by the following description, M-283 is here and in its natural habitat, as Mrs. Clint has written, ". . . very neat in habit and almost never varying in size or height or color." Growing in a five-inch pot in the B. E. F. greenhouse, M-283 is virtually evergreen. In the following description all data were secured at anthesis. *Leaves:* erect, glossy, bright green, sometimes tinted mahogany at base; linear; channeled on upper side, convex and slightly fluted on lower side, flat apically. *Peduncle* (scape): 9-15 cm. high. *Pedicel* (stripe): 10-26 mm. long. *Spathe:* entire or fen-

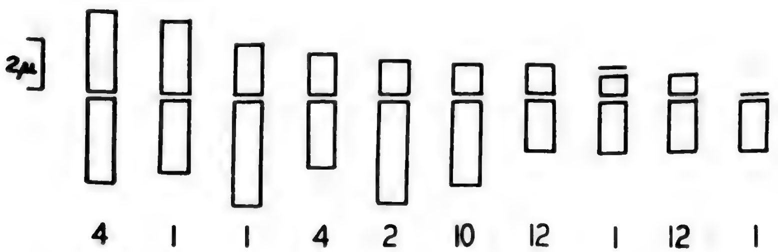

Figure 22. Idiogram of somatic metaphase chromosomes of *Zephyranthes clintiae* (M-283). The number of chromosomes of each type is shown below.

estrate; 28-34 mm. long, united about ½. *Tepaltube:* 11-19 mm. long. *Tepalsegs:* light salmon pink; oblanceolate to spatulate. *Petsegs:* 25-31 mm. long; 8-13 mm. wide. *Setsegs:* usually 1-2 mm. longer and wider than the petsegs. *Stamens:* The petaline filaments are consistently 1-2 mm. longer than the sepaline filaments. The anthers on the petaline filaments are equal to or 1-2 mm. shorter than the anthers on the sepaline filaments. Thus the stamens are sometimes of equal height. Free petaline *filament:* white, 9-13 mm. long. *Anther* on petaline filament: 6-8 mm. long, versatile. *Stigma:* trifid; lobes short, globulose; white; located below or surrounded by bases of anthers.

CYTOLOGICAL METHOD

Actively growing root tips were excised and placed in a 0.2 percent aqueous solution of colchicine at 62° F. for 4½ hours. After fixation in acetic-alcohol (1:3) 12-24 hours, they were stained in two percent acetic orcein (9 parts) to which normal HCl (1 part) had been added. The staining solution containing the root tips was heated to nearly boiling. The meristems were then squashed on slides in one percent acetic

orcein. The slides were made permanent with Euparal after floating off the cover glasses in 95 percent alcohol (Blackwood, 1958). Three slides are on deposit in the B. E. F. Permanent Slide File.

RESULTS

In *Z. clintiae* (M-283) 2n=48. The several types of chromosomes found in almost every clear cell examined (over 200) in several root tips from each of three bulbs are shown in Figure 22—the data on these are presented in Table 1. One cell with 24 chromosomes, presumedly a

Table 1. The number of chromosomes of each type (Number) in **Zephyranthes clintiae** (M-283), the length of each (Length) in microns at metaphase following colchicine treatment, and the ratio of short arm length to total length of each type (C. Index.)

Number	4	1	1	4	2	10	12	1[s]	12	1
Length	6.5	5.8	6.2	4.4	5.4	4.8	3.3	3.3	3.0	2.2
C. Index	.5	.5	.33	.38	.27	.27	.38	.38	.29	*

s—satellite on short arm. *—acrocentric chromosome

result of somatic reduction (Huskins and Cheng, 1950), was observed.

Figure 23. Photograph of colchicine treated, root-tip cell (x1833) of *Zephyranthes clintiae* (M-283), a—acrocentric chromosome.

Occasionally a cell with a somewhat different karyotype was seen, but no two of these anomalous cells appeared alike. Most of the variations detected were centric shifts in the long, normally metacentric chromosomes.

DISCUSSION

Hume (1935) listed a dozen species of *Zephyranthes* reported from Mexico, although "not more than half are known except as herbarium specimens." Since then two new species (*Z. Fosteri* Traub and *Z. clintiae* Traub) have been described, while *Z. concolor* (Lindl.) Baker has been determined to be an *Habranthus* (Flory and Flagg, 1958) as was originally thought to be the case.

No cytological information is available for seven of the reported species: *Z. arenicola* Brand., *Z. brevipes* (*Z. carinata* var. *brevipes* Baker), *Z. Conzattii* Greenm., *Z. erubescens* S. Wats., *Z. Fosteri*, *Z. Nelsonii* Greenm. and *Z. tepicensis* Greenm. Somatic chromosome numbers have been reported for five species:

Species	2n	References
Z. grandiflora Lindl.	46	Nagao and Takusagawa, 1932.
(syn.: *Z. carinata* Herb.)	48	Inariyama, 1937; Sato, 1938; Flory, 1941, Coe, 1954.
	48, 49, 46–54	Flory and Flagg, unpub.
Z. Lindleyana Herb.	48	Fernandes, 1930 and 1931.
	24	Sato, 1938.
	ca. 96	LaCour, 1955.
Z. longifolia Hemsl.	46	Flory, 1940.
	44–50	Coe, 1954.
Z. macrosiphon Baker	48	Flory, 1940.
	46	Flory, 1941.
Z. verecunda Herb.	24	LaCour, 1952.
	48	Flory, unpub.

Along with the apparent polyploidy and aneuploidy, it is of interest to note that a taxon with a somatic complement of 48 chromosomes has been observed for each of these five species.

Inariyama (1937) supposed that *Z. grandiflora* was a tetroploid on the basis of quadrivalent formation; meiotic clumps containing more than four chromosomes were interpreted by him to result from reciprocal translocations. Sato (1938), and also Sharma and Ghosh (1954), concluded that six was the base (x) number for *Zephyranthes*. This belief was founded primarily on the existence of *Z. robusta* and *Z. Taubertii*, both of which are synonyms for *Habranthus robustus* with six pairs of chromosomes. Evidence accumulated in our own laboratory leads to the conclusion that six is probably the basic chromosome number for most, if not all, members of the tribe ZEPHYRANTHEAE (Pax) Hutchinson. Published reports on *Zephyranthes*, *Cooperia* and *Habranthus* (Flory, 1939, 1944, 1948, 1954, 1958, 1959a, 1959b; Flory and Flagg, 1958, 1959) as well as considerable work (with regard to somatic chromosome numbers, structure, etc.) chiefly support this postulation. The situation in *Sprekelia* (Bose, 1958), included in the ZEPHYRANTHEAE by Traub (1940), also seems to indicate six as the base number here. If six is the base number in *Zephyranthes*, then members of this genus, such as *Z. clintiae* (M-283), with somatic complements of 48 chromosomes are octoploid.

Chromosomes with dot-like second arms are referred to as *cephalobrachial, rod-shaped, telocentric* or *acrocentric* by various authors. Some writers use the term cephalobrachial in conjunction with heterobrachial and isobrachial. The term rod-shaped is ambiguous—being used to describe chromosomes with either subterminal or reportedly terminal centromeres. The term telocentric is classically reserved for chromosomes with terminal centromeres. 'Telecentric' is unfortunately somewhat

equivocal in that it has been used to designate chromosomes with dot-like second arms (White, 1945) and some authors (particularly persons working with mammalian tissue cultures) still misuse it for that purpose. Although 'acrocentric' might also imply a terminally located centromere, to the best of our knowledge it is used only in describing subtelocentric chromosomes when the tiny second arm is not usually seen (White, 1954) (Figs. 23 and 24).

Sharma and Ghosh (1954) reported "telocentrics" and "other fragments" in *Z. rosea* Lindl. (native to the West Indies and Guatemala) as resulting from the combined use of oxyquinoline pretreatment and fixation in chromic-formaline mixture. It may be worth noting that the present writer has seen chromosomes which were broken at the primary

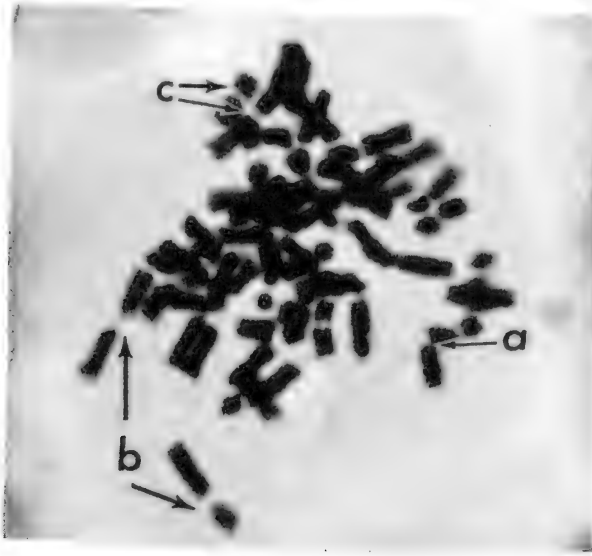

Figure 24. Photograph of colchicine treated, root-tip cell (x2000) of *Zephyranthes clintiae* (M-283), a—acrocentric chromosome, b—broken primary constrictions, c—primary constrictions slightly stretched.

constriction (Fig. 24b) following pretreatment with 0.2 percent colchicine or saturated *p*-dichlorobenzene solution and fixation in acetic-alcohol. This was assumed to result from excessive pressure during squashing, for the number of breaks increased as greater force was applied. Sometimes the primary constriction was stretched but unbroken (Fig. 24c). Whether breakage at the primary constriction indicates a natural physical weakness or one produced by chemical treatment is an unanswered question.

Inariyama (1937) reported on *Z. candida* Herb. (Argentina), ". . . exact points of insertion being different in different chromosomes, and in a few of them it is terminal or median." Regarding *Z. grandiflora*

he wrote, "The different chromosomes are characterized by various types of insertion as in *Z. candida.*" No telocentric or acrocentric chromosome is shown in his drawing of *Z. grandiflora.* Telocentric and acrocentric chromosomes have not been observed as natural cytological components in any accession of these two species at Blandy Farm (Flory, unpub.) The acrocentric chromosome found in *Z. clintiae* appears to be a constant, natural cytological component for the taxon described here. It was present in all the clear cells examined. Neither telocentric nor acrocentric chromosomes have been reported in other species of *Zephyranthes.*

SUMMARY

In *Zephyranthes clintiae* (M-283) 2n=48. The somatic chromosome complement consists of five long metacentrics, one short acrocentric, and 42 submetacentrics which can be distinguished as: one long, two long nearly subtelocentric, 10 medium nearly subtelocentric, four medium, 13 short (one of which has a satellite on the short arm), and 12 short nearly subtelecentric chromosomes. The cytology of Mexican *Zephyranthes* and reports of telocentric chromosomes in *Zephyranthes* are reviewed. It is postulated that the basic chromosome number of the ZEPHYRANTHEAE may be six.

ACKNOWLEDGEMENTS

We are greatly indebted to Mrs. Morris Clint for supplying plants and excellent ecological data. We thank Mr. L. R. Emmons for assistance with the photography. Deep gratitude goes to Dr. W. S. Flory, Jr., for his stimulating interest and constructive criticism.

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AMARYLLID GENERA AND SPECIES

HAROLD N. MOLDENKE

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Hippeastrum damazianum Beauv. Bull. Herb. Boiss. ser. II, 6: 585, fig. 3. 1906. Leaves loreate-linear, obtuse, 25—30 cm. long, 2—3 cm. wide; scape compressed, glaucous, purple-variegated, 16—25 cm. long; leaves of the spathe lanceolate-obtuse, membranous, pink, purple-dotted, surpassing the pedicels, 6—7 cm. long; perigonium campanulate, 10—11 cm. in size, glistening vermilion, with a shiny greenish star, purple-punctate, the tube shorter than the ovary, 0.7—0.9 cm. long during anthesis, naked in the throat within; sepals obovate, attenuate, with the midrib yellowish-green and prolonged into a callous point, 3 cm. wide, the outer ones wider than the others; stamens ascending, 9—10 cm. long; filaments flattened, pink, purple-dotted; anthers 0.7 cm. long; style pink, surpassing the perigonium, 11—12 cm. long, trigonous; stigmas vermilion, 3-fid, linear, 0.5 cm. long, spreading-recurved after anthesis, slowly becoming erect; pollen yellow.—Related to H. rutilum Herbert.—The type was collected by L. Damazio (no 1481) in October, 1904.

CRINUM ASIATICUM VAR. CUPREFOLIUM

Hamilton P. Traub, *California*

In the 1954 Amaryllis Year Book (Herbertia), page 47, it was indicated that Mr. & Mrs. Corbet of La Canada, Calif., had obtained a reddish-leaved *Crinum* from a garden in Hawaii, and that they had

Fig. 25. *Crinum asiaticum* var. *cuprefolium* Traub, *var. nov.*, a bronzy-coppery-red leaved, dahlia purple flowered variety that is grown in Hawaii; and in the United States since 1954. Lower, showing the plant as grown in an 8-inch pot at La Jolla, Calif. Upper, close-up of part of the same plant. Bulb obtained through the kindness of Mr. & Mrs. Corbet of La Canada, Calif.

kindly presented an offset to the writer. It was stated that this could not be *Crinum erythrophyllum* Herb., a dwarf prostrate species from Burma. In 1958 and 1959, the reddish-leaved *Crinum* from Hawaii bloomed in July in the writer's garden at La Jolla, Calif., a frost-free

spot on the Pacific Ocean. The plant was grown in an 8-inch pot where it apparently could not reach its maximum development, and the vigorous root-system broke apart the clay pot in 1959. The bulb has since been planted outdoors beside the giant everblooming *Crinum asiaticum* var. *asiaticum* where the former also can reach full development. Specimen leaves obtained from other growers show that they are much longer and wider in large specimen plants.

Our plant apparently belongs to the *Crinum asiaticum* alliance, but it differs in a number of characters from *C. asiaticum* var. *asiaticum*. The leaves are narrowed toward the base. When first produced, the leaves are bronzy-coppery-red, but there is a tendency for some of the color to be lost with age, particularly if the plant is exposed to full sunlight. In partial shade, the color persists longer and to a greater extent. It is a handsome and colorful plant worthy of a place in the tropical and sub-tropical garden (Fig. 25). The plant appears to bloom only once each season—in summer—as contrasted with *C. asiaticum* var. *asiaticum* which is everblooming here. Our plant has dahlia purple flowers, the color showing through the white ground color from the outside to the inside of the segs.

The variety has been named for its most outstanding character—the bronzy-coppery-red leaves.

Crinum asiaticum var. **cuprefolium** Traub, **var. nov.**

Haec varietas a forma typica speciei foliis aeri-cupri-rubris deinde rubiginosi-viridibus et floribus purpureis aestivalibus recedit.

Bulb, in the type plant, almost narrowly oblong, with slight enlargement toward the base, 20 cm. long, 8 cm. in diam. *Leaves* up to 10 or more, sheathing at the base, at first bronzy-coppery-red, changing to a rusty green with age, up to 92 cm. long or longer, nearly elliptic, lorate toward the base, 5.5 cm. wide at the base, widening to 10.5 at the middle, narrowing to an acute-bluntish apex. *Scape* solid, near dahlia purple (HCC 931), flattish, with rounded edges, 45 cm. long or longer, 9 x 14 mm. in diam. at the base and apex. *Spathe* 2-valved, lanceolate, valves deeply tinged with dahlia purple, 8—8.2 cm. long, bracteoles very much smaller, mostly filiform. *Umbel* 12-flowered. *Pedicels* near dahlia purple (HCC 931) 0.5—2 cm. long, 4 x 5 mm. in diam. *Ovary* 1.4 cm. long, 5 mm. in diam., near dahlia purple (HCC 931); ovules few per locule. *Tepaltube* near dahlia purple (HCC 931), 8—8.5 cm. long, 4 x 4.5 mm. in diam. at the base, 4.5 mm. diam. at the apex. *Tepalsegs* linear, held more or less horizontally, upper ends slightly recurved, magnolia purple on under side, keel deeper colored (HCC O30/1), lighter towards the margins, much lighter (HCC O30/3) on upper side (due to the showing through of the magnolia purple in the white ground color). *Setsegs* 7.2—7.5 cm. long, 9—10 mm. wide; *Petsegs* 7—7.2 cm. long, 9—10 mm. wide. *Stamens* attached at the base of the tepalsegs, longer than the style; filaments 4.4—4.8 cm. long, deep magnolia purple (HCC O30); anthers 1.3 cm. long at anthesis; pollen yellow; *style* filiform, deep magnolia purple (HCC O30), 3.6 cm. long; stigma minute.

Holotype: Traub Nos. 621a+621b (TRA), July 15, 1958, cult. La Jolla, Calif., grown from bulb collected in 1954 by Mr. and Mrs. Corbet of La Canada, Calif., in a garden in Hawaii. Also observed by Otto Degener in Hawaii; and received from Hawaii by Wyndham Hayward, Winter Park, Florida, and Cecil Houdyshel, La Verne, Calif.

3. GENETICS AND BREEDING

THE AMARYLLIS BREEDING PROJECT AT SOUTHWESTERN LOUISIANA INSTITUTE

Ira S. Nelson

The problem of obtaining living bulbs of *Amaryllis* species for foundation stock has been quite frustrating at times. However, by 1954, a collection had been assembled and the breeding work was started in earnest. How this collection was assembled will be found in other pages of this volume. It is only fair to acknowledge that the project would not have been possible without the species obtained by the Louisiana Society for Horticultural Research. Most of the species mentioned in this article were obtained by two plant-collecting expeditions sponsored jointly by that organization and Southwestern Louisiana Institute.

The basic objective of the *Amaryllis* breeding project at Southwestern Louisiana Institute is to develop new types of garden *Amaryllis* rather than to improve the existing types. This project is aimed at tapping the great store of diverse characteristics found within the genus. It is hoped that new types can be developed which will appeal to gardeners not now growing the fine modern hybrids as well as the confirmed *Amaryllis* fans.

This project is based on the use of species as a source of characteristics not found in the modern hybrids. As many species as possible are being crossed; they also are being crossed with available hybrids. The primary crosses as well as the species are being retained for future breeding stock as little can be expected until advanced generations are produced.

This report will be confined to the crosses which have been successfully accomplished. Others which were tried but failed will be omitted. The female parent of the hybrids will be given first and, if made, reciprocal crosses will be indicated. There is no evidence to date that the progeny of any cross differs from that of its reciprocal. In some cases, however, better seed set was obtained by using one species than by using the other as the pod parent.

Amaryllis belladonna x *A. evansiae* and reciprocal

This cross and its reciprocal were very readily made. Seed set abundantly and most of it was viable. The leaves of the progeny showed intermediate characteristics from the very early seedling stage. The flowers resembled *A. belladonna* in shape and size but in color were shades of pink on a yellowish ground instead of tomato red. They retained the droopy appearance of *A. belladonna* and might easily pass for color variations of that species. The F_1 generation varied in width of floral segments more than in any other characteristic. This was not unexpected in view of the same tendency in *A. evansiae*.

Self and sib-pollinations were made within the F_1's. A noticeable reduction in fertility was observed. The F_2 generation has not yet bloomed.

Amaryllis belladonna x White Dutch Hybrid

Most of the progeny of this cross exhibited the *A. belladonna* color and color pattern. Of approximately 50 seedlings only 3 showed any marked deviation in color. These three were a delightful salmon-pink with the characteristic *A. belladonna* marking in the throat. The size of the blossoms, however, approximated that of the White Dutch hybrid parent. In all cases the stigmas were trifid and the tepaltubes proportioned like those of *A. belladonna.* Both sib and self-pollinations were made with the F_1 generation. Little loss of fertility was observed in these hybrids. The F_2 generation has not yet bloomed.

Amaryllis belladonna x Pink Dutch Hybrid

This cross produced progeny with varying shades of pink flowers all of which had the white pattern in the throat and the longer tepaltube of *A. belladonna.* A few individuals with exceptionally brilliant pink color were self and sib-pollinated. There was apparently little loss of fertility in the F_1 generation. Like the above mentioned cross the flowers were large and had trifid stigmas. More variation was observed in this cross than in the preceding cross. The F_2 generation has not yet bloomed.

Amaryllis belladonna x Red Dutch Hybrid

Some of the progeny of this cross did not exhibit the typical *A. belladonna* pattern in the throat. However, the *belladonna*-type tepaltube and somewhat pointed floral segments persisted in the F_1 generation.

On the whole the flowers were larger than those of *A. belladonna* but smaller than the flowers of the red Dutch hybrid parent. The form of the flowers tended to be more like *A. belladonna* than the red Dutch parent except for color, which closely approximated the color of the red Dutch parent.

Orange-pink *Amaryllis belladonna* x *A. striata*

These two species are very similar in general conformation, color, size and color pattern. Their hybrids are intermediate between them, some favoring one parent more, some the other. They have the trifid stigmas of *A. striata* as well as its light-yellow pollen color. The throat pattern is intermediate between the two species.

Amaryllis evansiae x White Dutch Hybrid and reciprocal

The reciprocal of this cross was attempted at the same time that this cross was first made with complete failure. However, in subsequent years it has been accomplished with limited success. Our experience indicates that this cross can be facilitated by using *A. evansiae* rather than the white Dutch hybrid as the female parent. The hybrids here reported had *A. evansiae* as the female parent. The color of the progeny of this cross which have bloomed are pink or partially pink. They all

exhibit a greenish-white star in the throat and a trifid stigma. The tepaltubes are longer than those of the white Dutch parent. The flowers are as large as those of the Dutch parent and the floral segments as wide.

The intensity of the pink color varies to some extent. It is, however, a very clean pink which is free from the blue cast so commonly found in many of the Dutch hybrids. This clear pink color, a result of crossing pale yellow with white flowers is probably unstable genetically because of its hybrid origin. Both yellow and white-flowered sorts should appear in the F_2's which have not yet bloomed.

Apparently the progeny of this cross are reasonably fertile as no great difficulty was encountered in obtaining seed from either self or sib-pollinations.

Amaryllis evansiae x *A. striata* and reciprocal

This cross, which was reported in the 1959 issue of Herbertia, offers something different and we believe worthwhile in hybrid *Amaryllis*. Unfortunately black and white pictures are incapable of conveying the delicate beauty of the flowers.

The reciprocal cross was made with equal ease and the resulting progeny are the same. Because the progeny of this cross is so uniformly good and distinctive, clonal selections will not be made at this time. Instead the entire progeny is being released as the S. L. I. "Senorita" hybrids. In these hybrids we find a new type of *Amaryllis* which should be equally suited to garden and cut-flower purposes. The blossoms are relatively small (about 3½ inches in diameter), graceful and exquisitely colored. The ground varies from cream to pale yellow which is overlaid with a blushing of pastel pinks. Tepalseg width varies to about the same extent as that of *A. evansiae*. The posture of the trumpets is slightly above horizontal which gives a jaunty aspect to the flowering scapes. Slight ruffling of the tepalseg edges adds to the attractiveness of the series. The pollen color is pale yellow and the stigmas are trifid like *A. striata*. See Fig. 26 on following page.

The S. L. I. "Senorita" hybrids can readily be obtained by the simple process of repeating this cross. Since both parents are available commercially it is possible to get into quantity production of bulbs rapidly by seed.

Amaryllis evansiae x *A. pardina*

Color prints of *A. pardina* appearing in an old horticultural journal show this species to have either white or pale yellow ground color with red spots. Although the writer has collected this species in three localities in Bolivia, only the form with the white ground color was observed. In one locality both *A. pardina* and *A. evansiae* were found. This brought up the possibility that the yellow ground colored form of the illustration could possibly be a natural hybrid and thus could be reproduced artificially.

The progeny of this cross which have bloomed to date (5 seedlings) all resemble the illustration mentioned. The flowers have a pale yellow

Fig. 26. Prof. Claude W. Davis, of Baton Rouge, and Prof. Ira S. Nelson, of Lafayette, Louisiana, are studying the Southwestern Louisiana Institute (SLI) *Amaryllis* group hybrids "Senorita", at Lafayette, Louisiana, March 1959. The "Senorita" group hybrids are crosses of *Amaryllis evansiae* and *A. striata.*

ground copiously overlaid with minute red dots on the inner surface of the tepals. The outer surface is pale yellow with no markings. Apparently, the genes which represent the white ground color of *A. pardina* are different from those which represent the white of the white Dutch hybrid. The F_1 progeny has reduced fertility, but some F_2's were obtained which have not yet bloomed.

Amaryllis vittata var. *tweediana* x White Dutch Hybrid

Limited success was had in effecting this cross. Only about a half-dozen seeds germinated. Of these only three have bloomed. The bulbs which have bloomed show flowers of considerable promise. The trumpet length is intermediate between the parents. The flowers are well poised on the pedicels and are of medium size (about 5 inches across). The color pattern is picote. The flowers are white with a narrow line of deep pink around the edges of the tepals. Pink dots are lightly scattered over the inner surface of the flowers. The posture of the flowers is slightly above horizontal.

These hybrids failed to set seed but because of the small number of flowers pollinated no conclusions can be drawn concerning their fertility.

Amaryllis vittata var. *tweediana* x *A. reginae*

The single bulb which bloomed from this cross bore flowers with a striking resemblance in form to *Amaryllis* x *johnsonii*, the first hybrid reported; the color, however, was pink instead of red. No seed was set from self pollination of the single F_1 hybrid which bloomed.

Amaryllis pardina x *A.* x *johnsonii*

This cross produced most unusual appearing flowers. The *A. pardina* color and color pattern persisted but the number of red dots on the inside of the flower was greatly increased. The outside of the tepalsegs were white as in *A. pardina*. The flower shape and posture also more nearly resembled *A. pardina* than *A.* x *johnsonii*. This cross demonstrates the possibility of producing cultivars with contrasting colors on opposite sides of the tepalsegs. No seed was set from the progeny of this cross.

Amaryllis reginae x *A. evansiae*

This cross produced a generation of hybrids that is pinkish in color. The drooping habit of the *A. reginae* is transmitted to the hybrids. The entire progeny has less intense color on the outer side of the tepalsegs than on the inside. Compared to other hybrids involving *A. evansiae* these are rather drab in appearance. Tepalseg width is generally wider than the *A. evansiae* x *A. belladonna* hybrids.

The F_1 generation does not appear to be completely sterile as a small amount of viable seed was produced. The F_2 has not yet bloomed.

LIST OF CROSSES WHICH HAVE NOT YET BLOOMED

A. belladonna pink Bolivian form x **A. evansiae**
A. belladonna x **A. cybister** and reciprocal *
A. evansiae x **A. aglaiae** and reciprocal **
(**A. belladonna** x Orange Dutch Hybrid) x Self
(**A. belladonna** x White Dutch Hybrid) x Self
(**A. belladonna** x Red Dutch Hybrid) x Self
(**A. belladonna** x Pink Dutch Hybrid) x Self
(**A. evansiae** x **A. pardina**) x Self
A. evansiae x (**A evansiae** x **A. pardina**)
A. evansiae x (**A. evansiae** x **A. striata**) and reciprocal
(White Dutch Hybrid x **A. evansiae**) x **A. evansiae**
A. evansiae x **A. striata** very small-flowered selections were used
(**A. evansiae** x **A. pardina**) x **A. pardina**
(**A. evansiae** x White Dutch Hybrid) x Self
A. evansiae x (**A. evansiae** x White Dutch Hybrid)
A. evansiae x **A. cybister**
(**A. belladonna** x White Dutch Hybrid) x (**A. evansiae** x White Dutch Hybrid)
(Red Dutch Hybrid x **A. belladonna**) x (Pink Dutch Hybrid x **A. belladonna**)
(Pink **A. belladonna** x White Dutch Hybrid) x White Dutch Hybrid
A. striata x **A. pardina**
Pink Dutch Hybrid x Pink **A. belladonna** 1958 collection
A. pardina x **A. cybister**
A. pardina x Red Dutch Hybrid
(**A. pardina** x **A. evansiae**) x Freckled Pink Dutch Hybrid
(Orange-pink **A. belladonna** x **A. striata**) x Self
(Pink Dutch Hybrid x **A. Belladonna**) x Pink **A. belladonna** 1958 collection
Near-white Dutch Hybrid x (Pink Dutch Hybrid x **A. belladonna**)
White Dutch-Mead Hybrid x **A. divi-francisci**
A. forgetii x Self
A. pardina from trip 1 x **A. pardina** from trip 2
A. divi-francisci x Self
(**A. reginae** x **A. evansiae**) x Self

* Additional seed of the reciprocal cross was sent to the writer by Dr. Martin Cardenas, Cochabamba, Bolivia.

** Pollen of **A. Aglaiae** received from Dr. Joseph C. Smith, La Mesa, Calif., who made the reciprocal cross by using **A. evansiae** pollen shipped to him from Lafayette, La. Dr. Smith reported later that the reciprocal cross did not materialize.

[**HIGHLY COLORED CRINUMS**, continued from page 110.]

description as given by Bailey. The late H. Nehrling had a descriptive list of *Crinum* species included in Baileys Cyclopedia, on pp. 57-58, which also mentions *C. campanulatum* as follows: "*C. campanulatum (C. caffrum)*--Very distinct with beautiful glaucous green leaves and umbels of six to eight rosy-red campanulate flowers. The flowers are much recurved at their edges. It blooms several times a year. One plant, although 18 years old never made a side-shoot. It grows wild in ponds in Southern Africa and very likely needs moist soil." It is likely that this species may be closely related to *C. graminicola*. Certainly, such red-flowered species might prove a real asset to anyone wishing to develop highly colored *Crinum* hybrids, when used with such species as *scabrum, moorei,* and *bulbispermum.*

Crinum breeding has been going on since Herbert's time and apparently is still in the toddling stages. There is still much to be learned and the field is wide open. Perhaps some day we will break past the sterility problem and really produce a galaxy of improved hybrids. Lilies were once considered difficult to hybridize until a few breeders leveled their guns at them and broke down the barriers. Such a thing can be accomplished with Crinums in the near future with perseverance.

AMARYLLIS IN SOUTH AFRICA

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[PART 1—A TRIBUTE TO A GREAT HYBRIDIST.]

Here in South Africa, hybrid *amaryllis* should be synonymous with the name of the late Mr. A. C. Buller, who passed on early in 1959, when he was over 90 years of age. His interest in *Amaryllis* dates back to the turn of the century when he started acquiring bulbs of several species and also seeds of various unrelated hybrids from friends and acquaintances in overseas countries. In his acquisition of a valuable nucleus of what ultimately became a coveted collection, he was greatly assisted by the famous collector, Rothschild of England, who had contacts all over the world. Needless to say, Buller, in turn, contributed towards the Rothschild collection by the addition of specimens of flora indigenous to South Africa.

Buller's breeding programme continued uninterruptedly for half a century. He did not name his clones and none was ever registered—they were given stock numbers. He must have raised an astronomical number of seedlings, for he told me that he had retained for numbering only about two out of every thousand seedlings that bloomed for him—and he had many hundreds of numbered clones. From my own observations I knew that he was most critical in his selection. I have watched him discarding bulbs which would have been the envy of many a discerning gardener.

I first heard of Mr. A. C. Buller in 1947. Even to-day, there are many people in this country who have been growing *Amaryllis* for years and have never heard of the name of Buller. It must be added, however, that I have yet to meet a person so shy of publicity as was this great horticulturist. He was a man of means and one of the biggest exporters of grapes, pears and plums from South Africa. At first I thought his financial independence accounted for his avoidance of publicity of his *Amaryllis* collection, but I was soon to change my opinion. In viticultural and other research work in the plant world, he was as meticulous and patient as he was in his breeding of *Amaryllis* and through his discoveries and the practical application of methods which he had evolved, the whole of our viticultural industry was revolutionised. Of this and other of his achievements I learned from his contemporaries but never from Buller himself.

My own interest in *Amaryllis* was kindled in 1932, the year before my marriage. This is one of those pleasant mother-in-law stories. My wife's mother, a Berliner by birth, had a few lovely blooms. They are still in existence and even by present-day standards they remain attractive enough though somewhat out of date. She gave me a few clones which I lost through those wretched worms before the advent of D. D. T. This, however, only tended further to stimulate my interest in and love for those majestically beautiful blooms.

It was at a flower shop in Johannesburg in 1947 that I heard of Buller. I drew the attention of a friend to some attractive *Amaryllis* blooms on display, trying to find words to express my admiration. She conceded that they were good but added that I would not rave about them if I had seen the Buller collection at Stellenbosch in the Western Province, as was her privilege. I was all ears to find out more about that man Buller, his address, his prices, whether he issued a catalogue, etc. Her reply was that I should not waste my time with Buller. He was a crank. He bred only for his own pleasure. His garden was open to the public on specified dates when visitors were allowed entry upon payment of specified fees and the gate money was handed over to specified charities. Every few years he would stage an exhibit at a suitable place in Capetown, some twenty odd miles from Stellenbosch, and the exhibition to which entry was charged, would be in aid of the Red Cross Society. Buller did not sell bulbs. Not long after that, still in 1947, I had to come across the name Buller on two further occasions, the second of which played an important part in my life and was destined to change my career.

At that time I was connected with the steel industry and held the office of Controller of Iron and Steel and Assistant Director of Imports and Exports. This was also the year that the late King George VI and the Royal family visited the Union. Having been chosen as a member of the Royal Choir to appear before their Majesties with their reception in Johannesburg, I felt rather more closely connected to them than the "man in the street" and consequently followed every bit of news of them in every available paper. There I read about the hundred *Amaryllis* clones which their Majesties had accepted as a personal gift from the "famous hybridist." All of those clones are to-day growing at Kleinskuur, but more of that anon.

During the war years and the eight years following, whilst I held various governmental posts, my wife concentrated on Iris and devoted her time to popularising the Rainbow Flower in our country and introducing her own hybrids together with imported clones bred by the leading American and English breeders and those that came from Jean Stevens in New Zealand. By 1947, being the first commercial grower in South Africa, my wife was already well known to everyone who had an interest in Iris and that was how Mr. Buller came to hear of her. He wrote, requesting her to make up a collection for him to the value of the cheque enclosed and left the choice entirely to her.

Now, if you knew my wife with her alert mind and the faculty for doing the right thing at the right time, you would already correctly have guessed what she did. Yes, she made up a choice collection, including even some new clones which had not yet been catalogued and, moreover, returned Mr. Buller's cheque to him. This, of course, was done tactfully with an explanation that her husband was an *Amaryllis* lover. She knew he was the Amaryllis King of South Africa and she begged just a few of his bulbs in exchange for the Iris. She wished to have the bulbs

for a present to her husband and would be happy even if Mr. Buller could send only six.

The response was prompt and generous. A parcel of 150 clones arrived in perfect condition. I could barely believe the good news when my wife phoned me to my office in Johannesburg, fifty miles from our home KLEINSKUUR near Balfour. Suitable pots were immediately procured, brought home that week-end and the bulbs, all of which were already showing signs of buds, were duly potted. They were soon in bloom and were the cause of sensation, not only to us at KLEINSKUUR, but to all our friends and visitors. Correspondence between us and my benefactor at Stellenbosch, close on a thousand miles from us, became regular and Mr. Buller was bombarded with questions on cultural methods. These were answered in detail and he appeared to take pleasure in supplying much more information than that requested. He quite correctly assessed my ignorance whilst undoubtedly enjoying the sincere enthusiasm evidenced in my letters. On going through our voluminous Buller file before writing these notes, I became somewhat alive to the fact that after twelve years my childish exuberance had not waned.

During the ensuing six years I remained a week-end gardener. It was not until end of 1953 that I settled on the farm and relinquished office in the city in favour of full-time concentration on *Amaryllis* breeding.

Having apparently been satisfied that my enthusiasm was not merely a temporary fever or flash in the pan, Mr. Buller sent me more bulbs the following August, most of which, I would say, were of finer quality than the previous consignment. There were three to four bulbs each of many clones and the total weight of the parcel was close on 200 lbs. They bloomed in October and my letters to Mr. Buller became "essays" of evaluation and comparison as opposed to his "lectures" on colour, form, substance, texture, etc. Fortunately, I obviously did not make too much of an ass of myself in my bold appraisals, since the maestro tended to show more and more faith, not only in my treatment of the bulbs, but to some extent also in my judgment and taste.

It was in the winter of 1949 that the great event came to pass. A letter came from Buller, the otherwise reserved and undemonstrative English gentleman, displaying, what one might term, an emotional outburst for one so staid. He did not disclose his age but said he was over 80. For the past ten years he had been on the look-out for some worthy person to take over from where he intended relinquishing his breeding and propagation work and he thought that in me he had found that person. He expressed himself in a manner which could have led one to believe that the writer was asking a friend to do him a great favour. In the event of my favourable consideration of his suggestion, he would be glad if, during the coming October (blooming season) I could find time to visit him, so that he could acquaint me more fully and personally with his methods of cultivation, selection of parents etc., and ABOVE ALL,

to disclose to me his most secret method of vegetative propagation, a system on which he had worked for eleven years to perfect.

My wife and I counted the days till that October morning when we set off for Stellenbosch. At Mr. Buller's nearby farm, nestled amongst those impressive mountains which bring fame to the Western Province of the Cape, we were accorded a royal welcome. In a spacious conservatory of structural steel and frosted glass, a few hundred cut specimens were displayed in single vases as for an exhibition. These were arranged on ascending concrete tiers, in themselves shallow flower boxes in which grew blue Lobelia that cascaded down the sides. We gasped with amazement at such a feast of beauty and the beaming countenance of our host showed delight at our being so impressed.

The two years of pen-friendship was quickly moulded into a lasting close personal relationship. Within a few days my standard-size notebook was almost full of shorthand notes, a fair share of which was devoted to the great "secret". Mr. Buller informed me that cuttage had been practised for many years, but that the apparatus which he had designed, six units of which he had in operation, was something still unknown to the Amaryllis world. I solemnly undertook to guard his secret.

In principle, basically, the system is similar to that described by Mr. J. F. Stewart in Herbertia 1959, page 102, and which is grounded on the earlier experiments of Traub and Heaton (see Traub, "Amaryllis Manual"). During my visit to Mr. Buller in 1949 we discussed the feasibility of electric heating and the introduction of thermostatic control, which we were both sure would be an ideal improvement. After further enquiries upon my return, it proved that our domestic generating plant was inadequate for a departure from the conventional heating system applied by Buller. Whilst in principle the two systems are similar, the Buller "incubators" bear no resemblance to the apparatus described in the article by Mr. Stewart. In the Buller method which I have adopted, with a few adjustments designed to simplify operation, the moisture control of the medium is automatic. Whilst heat control is not automatic, it is an easy matter to limit variations in temperature to about 5°F. and thereby ensure optimum temperatures.

I have usually 100% success and I must assume that maturity with the Buller system is reached sooner. Upon reading Mr. Stewart's article, I kept a special check and found that a large proportion of the bulbs from segments placed in my incubators in September, 1957 came into bloom in October 1959. It is just possible that the composition of the medium tends to enhance development which pure sand, as advocated by Mr. Stewart, does not do. Whilst on the subject of heating, I find it most interesting to come across the following question in a letter from Mr. Buller dated July 26th, 1951: "Are your 'incubators' made of galvanized iron and are you heating by electric current and thermostats?" The answer is, of course, still "No."

All that I know about *Amaryllis*, I learned from Mr. Buller during those two weeks. Together, we spent many hours a day amongst his

plants and alone I spent as many again in his beautiful garden. He selected for me, we selected together and I made a number of selections on my own. Careful notes were taken of the stock numbers, a list of which I undertook to post to him the following July for lifting of the clones. When these arrived, the old veteran had added a few more which he felt I should have and in his letter advising of their despatch, he expressed his conviction that I then would have all of his very top-notch stuff. Again he sent extra bulbs of each clone so that, apart from incubation material, I should have a reasonable control stock.

In October 1951 Mr. Buller paid a flying visit to KLEINSKUUR. I always was and still am of the opinion that he wished personally to ascertain whether I was worthy of the confidence he had placed in me and of the results of his life-long task with which he had entrusted me. By that time I had laid out a fair-sized *Amaryllis* garden and a few hundred potted plants were suitably housed. Cold frames to accommodate thousands of propagated bulblets had been constructed and were partly in use and thousands of seedlings were being raised in neatly kept beds. Buller was visibly pleased. He was also impressed by the buildings I had erected and the water system I had provided. I did not have the heart to tell him that the few thousand pounds his benevolence cost me had left me broke and would prolong my sojourn in the Golden City from which I derived the cash income that was to pay for all this.

Although Mr. Buller for himself did not sell any of his *Amaryllis*, he did on occasions dispose of surplus stocks and "not-too-good" seedlings by way of sales for charity. A few weeks before my visit to him, he received a call from representatives of a firm of Holland bulb brokers or growers who offered him £10,000 (about $25,000) for his collection which he declined, I learned, with not too good grace! He similarly declined a further offer of £250 for one specimen each of four selected varieties. And yet, during his visit to Kleinskuur, Buller was looking forward to the day when the Kleinskuur catalogue would include Buller *Amaryllis*. During the few days he was here, we had a lot of fun together giving names to his varieties, so that they may one day be sent out to South Africa as "individuals" and not as mere "entities." It was also then that I learned from him of a few clones—his very latest and the last of his breeding efforts, which I had not seen, because the young incubated stock had not yet bloomed at the time of my first visit to him. In 1952, I received my last parcel of *Amaryllis* from A. C. Buller.

[To be concluded in the 1961 Amaryllis Year Book]

AMARYLLIS BREEDING REPORT, 1959

MRS. A. C. PICKARD
Houston, Texas

A walk through my *Amaryllis* garden when in full bloom gives me new inspiration to carry on with experiments in breeding. Two year old seedlings are progressively yielding blooms that are a constant source of delight.

One of the greatest joys of gardening is the production of new plants from seed and I was so excited this past April over two exceptional blooms which were obtained from a planting of dark red seedlings only two years old. My final choice, 'Dr. Pickard,' [Fig. 27] named for my husband, is a beautiful dark red clone with sturdy scape;

Fig. 27. Hybrid *Amaryllis* clone, 'Dr. Pickard', produced by Mrs. A. C. Pickard, Houston, Texas.

Leopoldii type flower with the inner tepalsegs lobed. The diameter across the face measured 9 inches; the top tepalsegs 4 inches across; and the color unblemished.

The parents of this clone are two Dutch hybrids, 'Superba' ('Purple Queen') and a very dark red (the color very dark; almost black) which

we had grown in the garden for about 10 years; which bloomed each year, and which had produced one or more offsets.

Anyone undertaking a breeding project with plants soon comes up against the problem of space since the chances of securing an outstanding color and form are greatly enhanced by growing large numbers of seedlings. Knowledge of strains with good potentialities can speed up efforts for obtaining outstanding hybrid Amaryllis. There are plenty of chances for disappointment but the more careful the selection of the parents, the more certain are outstanding offsprings. Beauty of flower, however, is the first consideration and without it all other qualities are worthless.

When the seedlings are blooming each flower should be checked, scoring it with the standard of perfection. Those that do not score the highest points should be destroyed. It is far better to get one or two outstanding *Amaryllis* than to save fifty or more that show no improvement over existing clones. One should work with the thought in mind to developing a hybrid a "little bit better."

My results with vegetative propagation have been most satisfactory. It is my objective not only to produce better clones but also to branch out in producing hybrids in the various flower type divisions which will encourage enthusiasts to grow *Amaryllis* that appeal to every taste. For you who have never grown Dutch hybrids—try them. I'll assure you that you will be delighted and will never grow tired of them.

HIGHLY COLORED CRINUMS AND A NEW HYBRID

THAD M. HOWARD, *D. V. M.*

Ever since I first became addicted to *Amaryllids*, I have been especially fond of Crinums. My introduction to the genus was limited to the "Milk-and-Wine" types, such as *Crinum bulbispermum*, and a few other unidentified types of similar coloring. I shall never forget the time when I added the hybrids to my collection and the impression that I got from the pure white umbels of *C. powellii album*, the rich pink of 'C. Houdyshel,' and the dazzling wine-rose of 'Ellen Bosanquet.' I also found the pink and white Louis Bosanquet very pleasing, but of all the hybrids I liked the color of 'Ellen Bosanquet' best. I marveled at the mystery surrounding the origin of this darkly colored hybrid and wondered what species Mr. Bosanquet might have used to achieve his "break" from the lighter shades. Shortly afterwards I was to discover the storehouse of information in HERBERTIA and learn that older and wiser heads than mine had not fathomed Mr. Bosanquet's mystery to anyone's real satisfaction.

My introduction to *C. scabrum* was a high point in my *Crinum* interest, for here was a huge widely opened flower of intense fragrance; of startling red and white coloration. What is more, it sets seed freely. Surely, I thought, this species must be of great importance in the production of highly colored hybrids. To my surprise, I found very little

in the literature about this species being much used for hybrid work. Apparently others had taken the "powellii" route by concentrating on *C. moorei* and *C. bulbispermum* for new hybrids. It seemed that *C. scabrum* had been overlooked in the quest for new hybrids to a great extent. I determined to try out this species to find out what it might transmit through hybridization. I tried many crosses using it as both pollen plant and seed plant, but unfortunately I found that most existing hybrids were sterile and would not set seed when pollinated by *scabrum*, nor would *scabrum* set seed when pollinated by these hybrids. My own attempts at crossing scabrum with 'Ellen Bosanquet' proved fruitless, even though Dr. Traub's crossing of these two Crinums was very successful. One day in 1952, I happened to have both *scabrum* and *bulbispermum* in flower at the same time and so I decided to try a new mating using these two "milk-and-wine" types. I very nearly talked myself out of attempting the cross since I could not see any good coming of it. I felt certain that my results would only be more mongrel "milk-and-wine" types that are often listed as "unidentified" in the trade. Still curiosity got the best of me and I made the crosses. I was pleased to find that I had obtained a few seed and that they sprouted at once. The few *scabrum* seedlings pollinated by *bulbispermum* had foliage that was typically *C. scabrum*. On the other hand, one of the *bulbispermum* seedlings pollinated by *scabrum* had bright green leaves in contrast to the usual bluish green foliage that typifies *C. bulbispermum*. I knew that I had a hybrid from the first, but now I had to wait patiently for it to mature in order to see it flower. I must admit that I had curiosity rather than any optimism holding my interest.

Four years later, in 1956, the seedling flowered during my absence and I was told that the flower had been pink. I was very surprised to know that I had gotten a solid-colored hybrid instead of a bicolor but the following year I got a chance to see it in bloom for myself. As the scape developed and the buds began to take on color I was shocked to find that they were very much like 'Ellen Bosanquet' in the darkness of the buds. The umbel was small, having only four buds, but the entire plant showed a superficial kinship to Mr. Bosanquet's hybrid. The foliage was similar too. When the flowers expanded, I raced to find a specimen of 'Ellen Bosanquet' in flower at a friend's garden in order to compare the two. I was elated to find that though somewhat similar in some respects, they were not identical, and that my new hybrid had a few characteristics of its own that made it distinct from any other hybrid crinums that I had seen. I pondered its virtues and its faults. The following year, the new clone flowered again, and this time there were three scapes and each scape now had eight blooms each. That year (1958) it also produced two offsets. This season it has flowered again and the plant now seems even finer than ever. Some of its early faults have vanished with maturity, but one important one still remains. The brightly colored buds tend to burn in the heat of the afternoon sun in our climate. If the day is cloudy or if the plant is grown where it receives light afternoon shade, the flowers will not be damaged and will open to perfection. What are its virtues? There are many, but the

most important one seems to be its unique coloring. The flower is much darker than 'Cecil Houdyshel,' and much lighter than 'Ellen Bosanquet,' being nearly intermediate in hue between the two. Unlike these two hybrids, the new clone has a much darker coloring concentrated down the center of each tepalseg so as to subtly suggest a stripe, thereby revealing its "milk-and-wine" origin. This combination produces an effect of dark rose laid over a deep pink background. Were the coloring only a shade less subtle, we would indeed have a true bicolor. As it stands, this effect is only hinted, but it is a strong hint at that. The plant is a strong grower.

The new clone is just another good example of how much surprise can be found in hybridization. There is very little in it to suggest the identity of either parent, either in color, form, fragrance, or habits. To be sure a few characteristics are retained, but these could go unnoticed. The umbels have 6-8 flowers, as in *scabrum*, and the scape is only a bit taller than the scape of that species. The flowers are funnel-shaped, opening less widely than *scabrum*, but much more so than *bulbispermum*. The fragrance is pleasing, but not as strong and sweetly scented as *scabrum,* yet far more pleasing than that of *bulbispermum*. The bulb increases at a slow but steady rate by offsets, as do both parents, but not nearly as rapidly as 'Ellen Bosanquet.' Thus far, no seeds have been produced from the new hybrid, and there is little reason to doubt that it is sterile or nearly so, since this seems to be the case with most hybrid Crinums.

All in all, I believe that we have a new hybrid that should prove acceptable in the trade due to its distinctive coloring and pleasing habits. In our hot South midland it does well in full sun, but will produce more perfect flowers where given light afternoon shade. In cooler climates this should not be a problem. The general garden effect is like that of 'Ellen Bosanquet,' but lighter in color with a darker pigmentation in the center of each tepalseg. Mr. Houdyshel chose his famous hybrid 'Cecil Houdyshel' from among some 600 seedlings of the same parentage. Other breeders have likely done the same. In the case of the new hybrid, I have but a single seedling to choose from. Even within such a limited sample, I feel that it has enough merit to deserve introduction. If this particular cross could be repeated many times, I would not be surprised to find that at least one such seedling might prove to be a duplication of Mr. Bosanquet's own vividly colored hybrid. At least we now have some strong clues that may help to solve the mystery.

In checking through early editions of HERBERTIA, I have found several statements by early hybridizers that seem to add fuel to theory that *C. scabrum* had an important part in the creation of Mr. Bosanquet's famous hybrid. In the 1935 HERBERTIA, Mr. A. Worsley had an article entitled HYBRIDIZATION OF AMARYLLIAE, which was reprinted from GARDENERS CHRONICLE (London), in which he discussed some of his own *Crinum* breeding. On page 57, he states "Recently I raised a new hybrid *Crinum* out of *C. scabrum* by *C. moorei schmidtii*. The female parent was a Jamaican variety, which is by far the finest form of *C. scabrum*. The seedlings flowered in three years and ten months,

and the foliage partook of the characters of both parents. The flowers were most like *C. moorei* in shape, but of a brilliant crimson-pink colour, more intense than in any *Crinum* I have ever seen before. Another seedling from the same fruit was not so intense in color. Both have refused to carry seed so far." This splendid red-flowered *Crinum* was later named *Crinum* x *worsleyi*, but was lost to cultivation shortly after flowering. W. Watson chose to name it after its originator. In Worsley's autobiography in the 1936 edition of HERBERTIA he said of his hybrid "When Mr. Watson first saw it in flower in 1900, he took off his hat to it, saying, 'This is a gentleman.' "

William Herbert also dabbled around with *Crinum scabrum* and *C. bulbispermum.* In his "Amaryllidaceae," 1837, pp. 335-380, he speaks of a hybrid *Crinum* using these two species. He also used several other species on *bulbispermum*, but he said that the *scabrum-bulbispermum* cross had the most beautiful flowers. In the 1947 edition of HERBERTIA is an excellent article on *Crinum* breeding entitled "Semi-Hardy Crinums" by Les Hannibal. In this enlightening article Mr. Hannibal mentions a hybrid 'Elizabeth Traub,' developed by Dr. Traub using the pollen of 'Ellen Bosanquet' on *C. scabrum.* "Out of a number of interesting F-1 seedlings, one of particular merit appeared, which was intermediate between the parents." This new hybrid is now available in the trade. Mr. Hannibal also mentioned the "walking-stick" hybrid Crinums developed in Australia, of which a few bore some similarities to 'Ellen Bosanquet,' but no mention is made of the species involved in these crosses.

A few years ago I received a very large *Crinum* bulb from Joseph E. Werling of Los Angeles which he had obtained from a South African bulb nursery. It was identified as *C. graminicola*, and had been sent with the following comments in their bulb catalog: "A new introduction and originally collected by us in N. Transvaal. The flowers, which are carried on 1 foot stems, are an umbel of big wine-red blooms. This is by far the most spectacular Crinum that we have seen to date." The large bulb was planted in my Aunt's garden in East Texas at that time, in 1954, since my Army duty prevented me from doing much gardening. It grew well the first year sending up very wide low growing foliage of a bluish green color. It seemed to make all of its growth at once and then rested the rest of the summer. I later moved it to San Antonio where it has continued to exist but grows very little each year. Strangely, the bulb has remained quite large considering the small amount of annual growth that it makes. Mr. Werling writes that his bulbs have never flowered either, but continue to exist. It is too bad that this species chooses to be difficult since the description of it is so glowing and it sounds so desirable.

Another red-flowered South African *Crinum* is listed in Bailey's "Hortus Second" and in his "Standard Cyclopedia of Horticulture" as *C. campanulatum.* There is a milk-and-wine *Crinum* that has been listed in the trade under this name, but it is in no way similar to the

[**HIGHLY COLORED CRINUMS**, continued on page 100.]

FIRST DECADE OF HEMEROCALLIS WASHINGTONIA

HAMILTON P. TRAUB, *California*

[PART II. SECTIONS 4 THROUGH 7; CONTINUED FROM VOL. 15, PAGE 79.]

In the 1959 issue of Plant Life, the first three sections of this article were published— (1) Colchicine-induced tetraploid parents; (2) pollen storage, pollination and hybrid tetraploids; (3) selfing tetraploids. In this article, the remaining four sections are briefly presented—(4) obtaining triploids by crossing tetraploids and diploids; (5) natural and artificial selection; (6) cultural methods, including collection and sprouting of seeds, transplanting of seedlings to field; and (7) the evaluation of tetraploid seedlings for garden value.

4. PRODUCING TRIPLOID HEMEROCALLIS

As soon as colchicine-induced tetraploid *Hemerocallis* were on hand, the writer attempted to produce triploids by crossing tetraploids with diploids. One early success was the triploid clone, 'Coronado' (Traub, 1954) which was obtained by crossing 'Tetra Starzynski' (Traub, 1949) and the diploid, 'Iowa' (Traub, 1949). 'Coronado' is self-sterile clone (Traub, 1951; 1954). Many other attempts were made later but the progeny were never quite as good as the tetraploid parent. This does not mean that it is not possible to obtain superior triploid daylilies by this method, but only that the writer has not used the right combination of parents in these instances. Others should by all means try this method of daylily breeding, and it is hoped with better success.

5. NATURAL AND ARTIFICIAL SELECTION

Those interested in daylily breeding have undoubtedly observed that breeders in the deep South and the southwestern states usually have a relatively large proportion of evergreen clones, and that breeders in the North depend mostly on deciduous clones. This state of affairs is brought about largely by natural and artificial selection.

First it is necessary to consider *tentatively* the types of plants on the basis of growing habit.

(a) Seeds of certain hybrids derived wholly or in part from deciduous species native to cold climates do not appear to sprout without cold-pretreatment; these are designated as *deciduous-A*. Experiments of the effect of cold pretreatment on the germination of seeds from deciduous-A type plants, of which the writer is not aware, may have been carried out by others. The writer has not made any controlled experiments and the statements made here are based on the observation of thousands of seeds planted, and seedlings observed growing in the field. Thus the conclusions reported here are subject to correction if they conflict with those obtained from controlled experiments.

(b) Seeds of certain hybrids derived wholly or in part from deciduous species such as *Hemerocallis fulva* sprout in warm climates without cold pretreatment; these are designated *deciduous-B*.

(c) It is generally known that there is still another class consisting of intermediates between the rigidly deciduous and evergreen types that were obtained by crossing deciduous and evergreen type plants. If the plants in the breeding plot are examined in January, for instance, in southern California, it will be found that in addition to the rigidly deciduous types there is the series of intermediate type plants that die down sometime before January but then send up new foliage by midwinter. Seeds with this combination of genes apparently sprout in warm climates without cold-pretreatment since they are relatively numerous. These intermediates are designated *deciduous-C*.

For *deciduous-A* seeds, the cold treatment is apparently necessary in order that the embryos may be prepared for sprouting. Of course, those breeding daylilies in the South could subject the seeds to the required cold period by storage in a refrigerator at the proper temperature. However, this is extra work, and apparently none of the southern breeders has as yet used this method to any great extent. The embryos with dominant *decidous A* genes do not sprout unless cold pre-treated, and thus the large proportion of the seedlings produced in the South are evergreen, with the exception of *deciduous-B* and *deciduous C* seedlings that may be present.

In the North, where the usual practice of planting seeds out of doors in the fall is followed, the hardy *deciduous A* seedlings apparently survive, and the less hardy evergreen seedlings may be eliminated. The fate of the *deciduous C* seedlings has not been investigated and these may or may not survive. The net result is that mostly deciduous clones are produced in the North.

Some of the evergreen seedlings produced in the South may not survive when planted in the North without protection with a mulch; and conversely, some of the deciduous seedlings produced in the North may not survive long in the South. Thus such a clone as the deciduous 'Crimson Glory' (Carpenter, 1950) died out here at La Jolla for the writer because it was not adapted to the frost-free climate of this spot. Those who have tried to grow *Hemerocallis* species that come from the colder parts of China, Korea and Siberia, have found out to their sorrow long ago that these will not thrive in the South. If they linger on for a time, they will sooner or later die out. The genes for the evergreen habit are derived from the species *Hemerocallis aurantiaca* which is native to the warmer parts of Japan. Thus the evergreen habit derived from this one species predominates in the hybrids grown in the South, and the deciduous habit of the wild deciduous species predominates in those produced in the North under the conditions indicated.

In the long run, therefore, the decidedly deciduous clones, the intermediate clones perhaps, and the evergreen clones sometimes, will be observed in the North; and the wholly evergreen, the intermediate clones, and the decidedly deciduous clones sometimes, will be observed in the South.

In scientific language this type of survival is referred to as natural selection since selection operates automatically under the given (natural)

climatic conditions. When man takes a hand and eliminates individuals capriciously, then artificial selection is involved by definition.

Thus natural selection is apparently the more important factor in the survival of hybrid daylilies on the basis of the deciduous versus the evergreen plant habit with different results in the South as contrasted with those in the North. But artificial selection does enter in to some extent when the breeder in warm climates eliminates the weaker ever-

Fig. 28. *Hemerocallis washingtonia* clone 'Tetra Arthustar' (Traub), a recurrent blooming tetraploid which has from three to four flushes of bloom each season at La Jolla, Calif., under good culture, showing second heavy seed crop for 1955 by self- and cross-pollination.

green plants; looks with disfavor on the weaker deciduous plants and deliberately discards them—preferring to save the relatively vigorous evergreen type plants. In the North weaker plants may also be discarded. To this extent, artificial selection enters into the survival of the seedlings on the basis already indicated.

On the other hand, when it comes to selection for plant stature, vigor, floral characters and frequency of blooming, artificial selection is responsible for survival. This type of artificial selection will be con-

sidered below in detail at the end of the article under the evaluation of tetraploid seedlings for garden value.

6. CULTURAL METHODS

Efficient cultural practices have much to do with the rapidity with which results are obtained. These include such operations as collecting and sprouting seeds, transplanting seedlings, mulching, watering, and so on.

SEED SETTING, COLLECTING AND PLANTING.—When early in the project it was found that certain seedlings were very efficient seed producers, the breeding stock was selected with this characteristic in mind. Thus 'Tetra Arthustar' (Traub, 1959), an early outstanding F_2 seedling was made the corner-stone for the red tetraploids. In Fig. 28 is shown the second seed crop of the season on 'Tetra Arthustar' in 1955. After even a larger first seed crop in late July, this second crop in September was almost as heavy. Mixed pollens from the superior reds were used in crossing on 'Tetra Arthustar', and also single flowers were pollinated with 'Tetra Rosalind' pollen. Thus, the capacity for seed production was combined with the superior red, rose and pink flower color. Ever after most of the progeny from these lines have been self- and inter-fertile; in fact so fertile, that it has been a real task to remove the many open-pollinated seed pods. A similar method was followed with the yellow, orange, purplish, golden-sheen and deep red (black) strains.

With such breeding stock it has been possible to produce large quantities of seeds each year, in fact so many, that only a portion of the crop could be planted each year due to lack of space.

Seeds may be harvested as soon as the three valves of the capsule are loose when manipulated by the hand. Seeds should be gathered before any are shed naturally. Seeds of tetraploid *Hemerocallis* are as a rule relatively larger and succulent. If stored in the dry condition at room temperature, they may soon wrinkle. The writer stored them in a closed glass container in the refrigerator at 43° F. for several weeks until all or most of a particular color strain were harvested. In this manner each strain can be planted at one time How long the seeds can be stored in this manner has not been determined—the writer did not store them in the manner indicated for longer than about 4 weeks.

The seeds were planted in 5- or 6-inch plastic tubs or azalea pots (see Fig. 29) in a mixture of half sand and half granulated peat. Canadian high-press peat was first soaked and expanded in water for a week or more, and the expanded peat was measured from this stock volume for volume. The seeds were sprouted in half-shade (lath-house). Germination was excellent in almost all cases as shown in the typical results (Fig. 29). A complete fertilizer was applied every three weeks.

PLANTING TO THE FIELD.—Seedlings reach the transplanting stage in about two months. At this stage they have from 2 to 4 leaves and a good root system if the correct soil medium is used. Thus seeds sown in July should give seedlings for transplanting in September; and those

sown in August may be transplanted from October to February. [Fig. 29]

Fig. 29. *Hemerocallis washingtonia* seedlings from the 1958 seed crop. Upper, tetraploid seedlings two months old (seeds planted Aug. 1958): left, in 5-inch plastic pot; right, pot removed to show root system.

Lower, part of 5 double-row plot. Seeds sown in pots Aug. 1958 and seedlings transplanted in Oct. 1958 are shown as the larger plants in the plot; several of these flowered in early July, 1959, nine months from seeds. Smaller seedlings shown in plot at lower first row (left) and 5th row (right), transplanted in Febr. 1959, showing effects of later transplanting. Block of 1956 seedlings (extreme right) being destroyed; only superior ones saved. Pacific Ocean in far background.

Spacing in the field.—The seedlings are planted in *double* rows 1½ ft. apart. Within the *double* rows, the two rows are spaced only 5 inches apart, and the plants in each of the rows are spaced 3 inches apart. By this method—4 plants per single-foot row, and 8 plants per *double*-foot row—it is possible to accommodate 400 plants per double

50-foot row. Thus during the planting season fall, 1956—winter, 1957, for instance, there were available 11 double rows, each 50 ft. long; and in this space it was possible to accommodate approximately 4,400 seedlings [Fig. 30]. In spite of this close spacing, a great many seedlings had to be discarded for lack of space. Although some seedlings bloom in 9 to 12 months from seed germination, in this climate—frost-free location on the Pacific Ocean—it requires about 18 to 24 months for all of the remaining seedlings to bloom. In the intervening season, it is not possible to make an entirely new set of crosses, and thus as a rule only some experimental crosses for revealing genetic principles are made. Thus in the planting season, fall, 1957—winter, 1958, only about three

Fig. 30. Part of field plot of the tetraploid *Hemerocallis washingtonia* in flower, La Jolla, Calif. 1958—mostly red-flowered seedlings. From Kodachrome slide by Dr. I. L. Furnas. Unfortunately, the blooms of the many red-flowering seedlings are difficult to distinguish in this reproduction; the fewer yellows show up fairly well.

Two color slides of this scene have been donated to the American Hemerocallis Society collection so that anyone interested may borrow these.

50-ft. double rows were planted, accommodating about 1,200 seedlings. In the planting season fall, 1958—winter, 1959, again, the seeds represented a full complement of new crosses. There were available 6 double 50-ft. rows, accommodating 2,400 seedlings [Fig. 29]. Again, many seedlings had to be discarded for want of space.

This method of close planting has obviously some advantages and disadvantages. Under advantages should be listed the important one that a great many seedlings can be tested on a relatively small area. Close planting is important in California, especially at La Jolla, where the land is limited, and where every foot of land is eagerly sought. The writer was lucky in being able to obtain a relatively large lot by standards here, but even this is small when considered on the basis of growing thousands of *Hemerocallis* seedlings.

The disadvantages are several, but can be overcome by additional time in testing after the selections have been made. Under close planting, the more vigorous plants may be observed, and a fair estimation of the flower color may be made. Since flower-color value is so important, the main objective of the breeder is realized. He can make his selections on the basis of color. These selected seedlings, usually only a limited number out of thousands, may then be tested in wider spaced plantings for optimum performance as garden plants.

Thus the disadvantages are indicated indirectly in discussing the advantages. In addition, one great disadvantage in close planting here is that the deciduous plants which go dormant in winter are crowded by the evergreen plants next to them. This can be overcome by planting deciduous seedlings in a separate block. Deciduous seedlings are characterized by relatively short initial leaves as contrasted with evergreen seedlings which make longer initial leaves. Another disadvantage in close planting is that it is difficult to get at the flowers for making pollinations.

Soil, cultivation and mulching.—The soil here is a virgin rich heavy clay which seems to be excellent for *Hemerocallis* since in five years no fertilizer has been applied, excepting mulching with lawn clippings when the seedlings are small. And later, after flowering, the dead flower scapes are placed between the rows, and the decaying leaves are left in place to increase the mulch. Under this type of culture, the weeding problem is practically eliminated. No cultivation is needed.

Watering.—In this climate, with an annual average rainfall of about 12 inches, all falling during October to June, and a dry season from June to October, it is necessary to water *Hemerocallis* by overhead irrigation for 2—3 hours once each week during the dry season from June to October, using a rain-bird type of sprinkler. Although the clay soil may be water-logged during some periods during the rainy season, this does not harm *Hemerocallis* in this climate. In Florida, the Lords grew their *Hemerocallis* on water-logged hammock land with great success. It has been reported, however, that in the North, well-drained soil is required for the survival of *Hemerocallis*.

Diseases, insects, mites, snails & slugs. *Hemerocallis*, including the tetraploids, are relatively free from pests. Aphids may be present on the tender new growth during winter and spring, but usually they do little or no damage. Only rarely is there any stunting. Aphids are checked or controlled by overhead sprinkling, and by natural rains.

Mites and thrips may be present in hot weather on the under side of the leaves but usually cause no important damage under good culture with weekly overhead watering for three hours.

Snails are present in this area and make their home in *Hemerocallis* plants but rarely do any damage since they eat the foliage only as a last resort. They are controlled by the regular snail poisons obtainable locally.

Sow-bugs and slugs may damage or even kill very small seedlings just set out into the open but will rarely harm them if ordinary weeds

are present as their food. Mulching with lawn clippings will keep them under control, or they may be controlled with the regular snail bait. So far no phytopathic or virus diseases have been observed on *Hemerocallis*.

7. EVALUATION FOR GARDEN VALUE

Hemerocallis are excellent greenhouse plants. Such a diploid clone as 'General MacArthur', for instance, likes warmth and produces the most dazzling red flowers under such culture. Tetraploids also make fine greenhouse plants. Since there is little interest in this subject at present, the discussion here will be confined to the evaluation of tetraploids for outdoor culture.

The objective of producing plants with beautiful flowers for the garden is ever present in the mind of the breeder, and thus he practices artificial selection of the most rigorous kind. The writer has found a few combinations of parents that give an unlimited number of excellent reds; all so nearly alike that it is hardly possible to make selections. These, however, are the exceptions *that test* the rule. As a general practice thousands of seedlings that do not quite measure up to the rigid standard in each generation, especially during the first several years of a project, must be destroyed. It is realized that such discards may yield excellent plants if used in further breeding, but a choice has to be made due to lack of space and financial means for carrying on an impossibly large project.

The more important characteristics sought in the hybrids include (1) plant vigor, (2) proper stature, (3) sufficient flowers per scape, (4) deciduous or evergreen plant habit, (5) recurrent blooming habit, (6) flower color, (7) flower size, (8) flower scape, and (9) resistance of flowers to heat (sun), wind and rain.

PLANT VIGOR AND STATURE.—Most growers prefer a rather vigorous plant habit, but it is clear that some of the tetraploids that grow over 6 ft. tall must obviously be discarded. Stature from dwarf to 3.5 ft. appears to be most desirable, but some that grow from 3.5 to 4 ft. may also be valuable in background plantings. The writer's personal preference is for clones that are intermediate in vigor and stature. Clones with rhizomes and those with numerous aerial scape offsets are quickly destroyed.

WELL-BRANCHED SCAPE.—The scape should be well-branched, producing 12 or more flowers. Clones with outstanding breaks in color but with fewer flowers per scape should only be maintained until the new flower color can be transferred by breeding methods to a plant with a many-flowered scape.

DECIDUOUS VS. EVERGREEN HABIT.—This subject has been previously discussed. In general the evergreen habit is preferred in the South and the deciduous habit in the North. However, there is a possibility that intermediates may become popular in both regions.

RECURRENT BLOOMING HABIT.—One of the important developments in the breeding of tetraploids is the general occurrence of recurrent blooming. At La Jolla, almost all seedlings bloom more than once each

season; many bloom three or more times, and a few are practically everblooming. Thus 'Tetra Carmine', 'Elizabeth Traub' and others appear to bloom whenever they grow actively from spring to early winter. Whether they will bloom as often when planted in the North or other southern locations still has to be determined. With respect to their practically everblooming habit, the tetraploids are similar to the diploids, 'Salmon Orchid', 'George Gilmer', 'Winged Victory', and so on. Thus it appears that the recurrent blooming habit can be developed in all daylilies.

Flower color.—Flower color is of the greatest importance and an all out effort is to be made to obtain distinctive and pleasing colors. The yellows and oranges were developed early in the history of the project. The first outstanding clones selected were 'Elizabeth Traub', an immaculate tangerine orange; 'Rev. Traub', a silky cadmium orange; and 'Magdalena Luethi', a lily-shaped, large wax-like empire yellow. Later, 'Canary Butterfly', a bright canary yellow, was obtained.

Really outstanding reds appeared only later with 'Billy Budd', a large, wide-open cardinal red; 'Capt. Reid', near chrysanthemum crimson; 'Madrid', flaming red; and finally somewhat later, 'Tetra Carmine', bright carmine red.

Much later, 'Lucia', a sunfast light pink, and 'Tetra Rose', a medium rose, appeared. And then also 'Purple Premier', purplish-reddish, and 'Violetta', lavender-reddish-violet, made their appearance.

Excellent polychromes, blends, eyed and bicolors appeared rather early, including 'Wyndham Hayward', a very large, wide-open tangerine orange with bright reddish eye-zone; 'Lemon Beauty', lemon yellow with faint reddish eye-zone; 'Alcazar', unique velvety nasturtium orange, with reddish eye-zone, and so on.

Flower size & shape.—There seems to be discrimination against smaller flowers and for that reason clones with medium-sized to large and very large flowers have been selected. Efforts have been made to select many kinds of flower shapes, from the very long narrow tepalsegs of 'Madrid' to markedly imbricated flowers as found in 'Elizabeth Traub'; from the large lily-shaped flowers of 'Magdalena Luethi' to the wide open flowers of 'Wyndham Hayward'.

Resistance of flowers to heat, wind and rain.—It is not always possible to achieve a desirable flower color and also the ultimate in its resistance to heat, wind, low atmospheric humidity, and rain. Thus very deep reds (black) have appeared that are outstanding in the morning but lose lustre by late afternoon. More work has to be done in such cases. However, such clones as 'Elizabeth Traub', 'Capt. Reid', 'Wyndham Hayward', 'Canary Butterfly', 'Madrid', 'Billy Budd', and many others stand up well here at La Jolla. Only wider testing will reveal if the flowers will also withstand unfavorable weather conditions in other regions.

THE NEXT DECADE

In the case of the diploid daylilies, the pioneers, beginning with Yeld (1893), Perry, Stout and others, did yeoman's service in providing

a vast reservoir of diploid germ plasma derived from the crossing of the various species. It was then easy for later hybridizers to grow vast numbers of seedlings and select out various desirable recombinations, including selfing to obtain desirable clones. In the case of the tetraploids, this first step was also necessary. The stock produced has been obtained by intercrossing the colchicine-induced tetraploids, including 'Tetra Rosalind' for pink color, in many possible ways by mixing pollens and thus obtaining more than one kind of cross in each capsule. The first stage was achieved in a relatively short time by this method. After ten years of this, the stage has been reached when the best selections from this vast reservoir of tetraploid germ plasma can now be used as the basis for further progress. From now on, it will not be necessary to grow so many thousands of seedlings each year and the effort can be directed toward perfecting the color strains by selfing, back-crossing, and recrossing with newly colchicine-induced tetraploids. Thus the most absorbing part of this adventure in plant breeding is just before us. The next ten years in the history of *Hemerocallis washingtonia* will undoubtedly see important progress in the development of the tetraploids. This will be recorded in a paper, "The Second Decade of *Hemerocallis washingtonia*" to be published in 1970.

LITERATURE CITED

Traub, Hamilton P. Triploid Daylilies. Euclides *14*: 221. 1954.
(See page 79, PLANT LIFE, vol. 15, 1959, for other references to literature cited.)

POSTSCRIPT.—In the above discussion the writer failed to mention that a semi-double yellow-flowering mutation bloomed among the tetraploids for the first time in 1958 (from 1956 seed crop). Thus it will be possible to breed a group of semi-double tetraploids from this starting point. It is hoped that a similar mutation in the red- and pink-flowering seedlings will take place. This would make unnecessary the crossing of red- and pink-flowering with the yellow-flowering plants and would speed up the breeding of semi-doubles.

Some of the uninitiated seem to believe that all tetraploids are over vigorous, but this is a misconception. By selection, it is possible to obtain a strain that is not too vigorous in growth. The main advantage of the tetraploids is in the greatly improved thick texture of the flowers. This thicker texture seems to be responsible for the high quality of the flowers, and this is the chief competitive advantage of the tetraploids over the diploids. This has to be seen to be fully appreciated.

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

AMARYLLIS BELLADONNA L. IN SOUTH TEXAS

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Of the nearly fifty species of *Amaryllis* now recognized, only one can be said to be in common cultivation as an outdoor plant in south Texas, this one being the scarlet *Amaryllis belladonna* L., described as early as 1789 by Hermann in Holland. A second species, *Amaryllis striata,* occasionally finds its way into gardens, but is more frequently grown in containers. *Amaryllis* x *johnsonii,* even more common in gardens than the Belladonna Lily, might easily be mistaken for a species, but most authorities consider this to be of hybrid origin.

As to how long *Amaryllis belladonna* has been grown on the Gulf Coast from Louisiana to the southern extremity of Texas, it is impossible to say. The early naturalist, Henry Nehrling, found *Amaryllis* x *johnsonii* growing abundantly in Houston, but did not see *Amaryllis belladonna* until he visited Florida in 1886 (Nehrling, *The Plant World in Florida,* 1933; *Die Amaryllis,* 1909, in translation by L. S. Hannibal). That the bulb has been growing in Houston, Corpus Christi and Brownsville for many, many years cannot be doubted, however. It appears to be a well-established species which is destined to stay with us.

An interesting question is that of the origin of the variety (or varieties) which we grow. One would suppose that our stock came from Florida where the species was very common in the higher sandlands of the central part of the state until fairly recently. It is a fact that at least one Texas nurseryman distributed this Florida material in the southern part of Texas (Otto Locke, New Braunfels, Texas). But it must be taken into account that the Florida form shows a preference, at least in Florida, for well-drained, sandy soils which are known to be slightly acid. Our bulbs, in contrast, appear to be perfectly happy in alkaline clays which need not be much amended with organic matter and not at all with sand. Perhaps at least a part of our bulbs originated in Mexico where the species is widely grown. One Corpus Christi gardener is known to have brought from Mexico, not many years ago, a single bulb, and from this small beginning, has hundreds in her garden now. It is hard to see much difference, when the bulbs are blooming, between this form from Mexico and the forms already growing here. It may be that a common form is grown in Florida, in Mexico and on the Texas coast. If such is the case, this form is adaptable to a wider range of soil types than generally supposed.

It is hoped that further observations of the species as represented in Texas will clear up some of the questions raised. Helpful in arriving at a correct conclusion would be a study of our bulbs grown under Florida conditions where a close comparison could be made with the

Florida form. Wyndham Hayward reports, incidentally, that the latter has become a rarity in Florida because of a succession of unusually severe cold spells.

Acknowledgements: To the following who contributed information used in this note I am most grateful: Mrs. Morris W. Clint, Brownsville, Texas; Mr. Wyndham Hayward, Winter Park, Florida; and Mr. Otto Locke, New Braunfels, Texas.

GROWING POPULARITY OF SPECIES AMARYLLIS

JOSEPH C. SMITH, *M. D., California*

Each year more *Amaryllis* fans become interested in growing the species, and the search for stock and information on how to grow them after they are found leads in many directions. Until recent years there were few species being grown anywhere in the United States. Now, thanks to such collectors as Mulford B. Foster, Harold N. Moldenke, Mary G. Henry, and Ira S. Nelson, we are in a position to enjoy more of the fifty known species of *Amaryllis* in our greenhouses and gardens. No collection now in existence, however, includes anywhere nearly all the species.

Among the earliest introductions were the *Amaryllis striata* forms which have been in cultivation in the southeastern section of the country since grandma's childhood and no one seems to know just how they arrived or how long they really have been grown there. From Tennessee southward and eastward one sees them as potted plants on many a rural front porch in summer. Their normal flowering period is January to March though they will often throw a scape again in the fall also. They are evergreen and multiply rapidly by offsets. They are usually fertile and set seeds readily. If they have a resting period it is immediately following the flowering period and at this time growth should not be forced by over-watering and fertilizing until the bulbs show sign of wanting to grow by sending up new leaves. They have a tendency to bloom themselves to death, and the hulk of a bulb that remains can be easily rotted with too much water. The color range is from very pale shades of salmon in the form *crocata* through salmon orange to bright scarlets in the varieties *fulgida* and *striata*. This is a very desirable species and many charming color shades can be found. The *striata* form should be carried over into white and solid red miniature hybrids. The "Gracilis" type hybrids is a step in this direction.

One of the other species long in cultivation is *Amaryllis belladonna* var. *major* that has been successfully naturalized in sections of Central Florida. Many a fancier has taken bulbs of this one home and tried to grow it in pots only to lose them in a short while. There are other forms of *A. belladonna* that are more reliable as potted plants, and if these could be made available, the unique *belladonna* forms would not have to be absent from many of our collections. The Louisiana Society for Horticultural Research has imported a Bolivian form that takes well to pot culture. Hybrids between *A. belladonna* and the giant hybrids

are coming on the market but these lose too much of the belladonna beauty in taking on the color and the shape of the Dutch hybrids.

Amaryllis reticulata var. *striatifolia* in the form of the hybrid 'Mrs. Garfield' has been in limited cultivation for a number of years. This is a first generation hybrid with many differences from the species. It retains the white stripe through the leaves and is much easier than the species to grow. The flower is nice and the season of bloom may be either spring or fall though usually it is in the fall.

Another amaryllis long in cultivation especially in Louisiana is *Amaryllis* x *johnsonii*. It is still argued as to whether this is a descendant of the original cross between *A. reginae* and *A. vittata* or whether this is a species that closely resembles this cross. I have had it to set seed but none have flowered as yet to show whether they will show characteristics back toward these species. *Amaryllis* x *johnsonii* is not too difficult in culture if one remembers to give it a heavy clay type soil.

Amaryllis immaculata has been grown in California to a limited extent since its introduction in the early 1940's as *Amaryllis candida* from Argentina. It is more exacting in its requirements but other areas might be found suitable to it if bulbs were plentiful enough to effect a wide distribution. I have not succeeded in flowering this one to date. *Amaryllis ambigua* has been grown equally as long but it too has not reached wide distribution. This species is currently available from at least one nurseryman. It is a long trumpet type and one of the few species now being grown that has a fragrance. It is next to self sterile though it is reported to produce parthenogenetic seed if pollinated with pollen from other species or hybrids. *Amaryllis ambigua* has a stubborn habit of remaining dormant over a whole season on occasions after being transplanted. Possibly it requires a little cold to break dormancy. It normally will stand more cold and rain than any other species I know except *Amaryllis elegans* itself. *Amaryllis psittacina* var. *decorata* is another species available from time to time. This is a more beautiful form of the red and green parrot colored amaryllis. The background color is green with red bordering the green keel and red stripes running the full length of the tepalsegs. It is a winter grower and should be allowed a dry dormant period of at least three months in the summer.

Amaryllis aglaiae is still relatively new on the scene and as far as I know has only been flowered once in the States. This occurred for me in 1958 when attempts were made to cross it with other *Amaryllis* hybrids and species. Mr. Nelson of Southwestern Louisiana Institute reported a cross with *Amaryllis evansiae* from pollen sent to him. I obtained but few seed and these resulted in even fewer seedlings. The interest here is to obtain the yellow color in the hybrids and eventually to have large flowered yellow hybrids. I understand that the Louisiana Society for Horticultural Research has had some success in this direction starting with the yellow form of *Amaryllis evansiae* which they introduced from Bolivia in 1954. *Amaryllis aglaiae* is not difficult to grow either potted or in the ground. It has been reported to be evergreen

which it is not at all. It comes from a region where there is seasonal rain fall of about 20 inches therefore when water is given to it when the temperature is high it will respond with about three spurts of growth per season sending up a full set of leaves four to six in number. When cooler weather comes in November it goes dormant not to resume growth until the soil is warm enough in mid April. It flowers soon after growth starts with a scape of yellow blossoms well above the new growth. This is a delightful miniature species of more formal growth than *Amaryllis evansiae*, the other miniature yellow species. In 1959 I did not obtain bloom and I am testing out a theory that too short and too wet a dormant period may be cause of failure to flower. Also it might require a little chilling during the dormant period. Cultural requirements of new species just have to be worked out by trial and error methods while at the same time trying not to make a mistake that will cost you your entire stock of bulbs.

Amaryllis evansiae has grown and flowered for me but I have lost much stock presumably because it was infected with virus disease. I have now obtained bulbs that are certified to be free of virus, and I hope to be more successful with this fine species. I have never had it set seed for me. If this could be accomplished it would be an easy matter to grow a quantity of seedling free from virus infection. From Louisiana interesting hybrids of this species have been reported and it may be just a matter of time until we have some new colors and forms to enjoy.

Amaryllis blumenavia is in cultivation in several collections. This is the smallest of the *Amaryllis* species. *Amaryllis blumenavia* is easily grown in the greenhouse. I have never tried it out doors probably for fear of losing the bulbs which are only about the size of a quarter when full grown. It seeds well and stock can be increased rapidly. At least one grower may soon offer it for sale.

Amaryllis aulica has been grown successfully both in California and Florida as an outdoor subject in the open ground. It is also quite adaptable to pot culture. Here it tends to grow in the winter months and go dormant in the summer. Flowering time is after growth starts in the fall; some times it flowers as late as Christmas time. Forms of this species have entered into the hybrid lines where it tends to give a characteristic red signet ring in the throat of the hybrid. It is too bad that its distinct flower form has not also been retained in some of the hybrids as this is a most interesting deviation from the usual but not to the extreme as the orchid flowered form *Amaryllis cybister*.

Amaryllis elegans var. *divifrancisci* is a very new species described in the present issue. Its flowering time and many of its cultural requirements have not been worked out as yet. My bulb has put up two blunt tipped leaves this fall that are of a medium green color. Seeds obtained last winter were easily germinated. I hope to have more to report about this species in the future.

I have recently obtained stock of *Amaryllis cybister* from Bolivia. This one to my knowledge has not been in cultivation in the States in recent years. It is orchid-flowered, like a *Sprekelia*, but has four or more flowers to the umbel. I have not flowered it yet and am cautiously

working out its cultural requirements. This one should give some very interesting new forms to the hybrids judging from its unique shape. Other species as yet unflowered include one reported to have rose colored flowers sent from Brazil and one with reddish foliage also from Brazil. One bulb has been received labeled *Amaryllis (Rhodaphiala?) marginata.* It has narrow leaves with a serrated margin and a very heavy bloom. An *Amaryllis* bulb obtained from Buenos Aires three years ago and illustrated here is probably a hybrid. It keys out in the *A. correiensis* group but seems a little too vigorous for a true species. Selfed seed are being grown to check on segregation. It is a very good garden subject and soon makes a clump. It is quite showy being cherry red with a broad cream white keel that extends well out toward the tip of the tepalsegs. There are four flowers five inches in diameter. I have had and lost *Amaryllis forgetii* but should be able to get it again from Peru. *Amaryllis stylosa* I have not yet received though promised from India. I have also a promise of a cream white species from Bolivia when the students return to the American Universities this fall.

Thus the quest for new *Amaryllis* species goes on with no stone being left unturned by the avid collector. Letters are written to far away places, missionaries and travelers abroad are contacted, foreign students to our schools are implored to help, and some of us are lucky enough to be able to go in search of bulbs ourselves. Growing the species is both fascinating and challenging, and a never ending source of enjoyment and accomplishment, especially when a rare specimen can be well-grown.

AMARYLLIS BLUMENAVIA

DOUGLAS D. CRAFT, *Illinois*

In the Spring of 1958, three small bulbs of *Amaryllis blumenavia,* about the size of acorns, were received from Mr. Mulford Foster. They arrived in bloom with four to six flowers to an umbel and one to two scapes per bulb. As no reference was included in shipment as to cultural requirements, the writer looked up the available authorities on the subject.

Mr. Mulford B. Foster in PLANT LIFE 6: *Collecting Amaryllids in South America,* p. 50, 1950 wrote that he found this Amaryllis growing:

> ". . . in a rather rich, moist section both in the forest and on the meadow edging the forest. Evidently it prefers rather moist conditions. With an umbel of 6 to 8 flowers, white, streaked with pale rose, this cheerful *Amaryllis* surely must come back to our collections. It is a small plant, only 6 to 8 inches high, but nevertheless a very worth while subject."

Dr. Hamilton P. Traub in THE AMARYLLIS MANUAL, p. 35, 1958, wrote:

> "In its native habitat *Amaryllis blumenavia* grows in wet meadows, . . . It should be well watered during the summer growing season, and sparingly during the winter resting period. It is best not to dry off the plant entirely at any time, . . ."

Fig. 31. *Amaryllis blumenavia* (C. Koch & Bouché ex Carr.) Traub. Showing plant in flower and fruit; slightly more than half (x 0.55) natural size. Drawing from living material by Douglas D. Craft.

Fig. 32. *Amaryllis blumenavia* (C. Koch & Bouché ex Carr.) Traub. A Front view of flower, about actual size. B. Flower in longi-section, showing ovules, short tepaltube, segs, stamens and style with trifid stigma; enlarged. C. Bursting fruit (capsule) showing seeds; enlarged. D. Seeds; greatly enlarged. Drawings from living material by Douglas D. Craft.

These two authorities thus constituted the basis for the following growing and cultivational experiment.

The bulbs were potted up in a 9-inch clay pot in a soil mixture composed of three parts leafmold, one part garden soil, one-half part Fertilife (a Chicago Stockyard by-product), five parts torpedo sand and one rounded tablespoon bonemeal. A layer of broken pot shards was placed at the bottom of the pot and a layer of sphagnum moss was added above it. Above this the soil mixture was added. The three bulbs were covered over their necks in the soil mixture as they would seem to have been growing previously.

The writer's cultivation diary records for September 1958 that *Amaryllis blumenavia* was growing well. Pot had been sunk to its rim outside for the summer in bright light. No direct sunlight struck them any part of the day. They were kept well watered and moist, but never soggy. Before frost, the pot was lifted and brought into the house and again placed in a bright light of the west window but with no direct sun.

In December, three young offsets had formed. Soil was watered occasionally during winter—it was never allowed to become completely dry as with some other *Amaryllis* species.

In April 1959, one scape appeared with but two flowers in the umbel. The other scape followed with four flowers to the umbel. Bloom wasn't as floriferous as expected. The question arose as to whether the pot was too large in diameter for the three bulbs. Should they have been crowded into a smaller pot? Or was the watering schedule during dormant period too frequent?

For the summer period of 1959, the procedure of the previous year was repeated. All leaves seemed to have died back after blooming except for the largest bulb. At this writing—the latter end of summer—*Amaryllis blumenavia* is showing its former healthy growth and new leaves have returned to replenish the old along with about four to five young offsets.

Regular feeding schedules at about two week intervals were maintained throughout the summer with Atlas fish emulsion (an organic liquid fertilizer) and Spoonit. Also, 3-12-13 commercial formula as per *Amaryllis striata* forma *fulgida* was used. The fish emulsion was used in preference to liquid manure, the latter being difficult to maintain in the city. Feeding was discontinued upon bringing the plants indoors for the winter.

The writer is convinced that rain water is to be preferred over city water whenever possible. It is also noted that this species would appear to be practically an evergreen one.

Amaryllis blumenavia is indeed a beautiful and fragile, jewel-like *Amaryllis*. It is also most ornamental when not in bloom because of the unusual and decorative shape of its leaves. It is highly recommended for all *Amaryllis* enthusiasts. Patience and experimentation with soils and feeding would do much to determine its exact cultural requirements. This *Amaryllis* species is well worth the growers effort as it has rewarded the writer already with a richly decorative and beautiful plant.

ADDED NOTE.—Mr. Foster, under date of October 1, 1959, writes: "... *Amaryllis blumenavia* will always be in the top list of *Amaryllis.* I treat it entirely as an evergreen and water it throughout the year. My soil is porous and there is never any danger of over-watering. In fact, I am as neglectful of it as I am of my thousands of Bromeliads."

PLANTING INSTRUCTIONS FOR AMARYLLIS SEEDS

ROBERT D. GOEDERT, *Florida*

Amaryllis seeds should be planted as soon as possible after they are received for best results since they will not keep their viability long during warm weather.

Well drained soil is essential. A sandy loam that has an open texture will do, however, most soils will be benefited by adding coarse sand as well as leaf mold or peat. It is best to use a liberal portion of well rotted cow manure or sheep manure in the soil with some bone meal or good organic fertilizer of a 4-8-8 mixture.

After your soil is mixed with the fertilizer and well pulverized, it is placed in a flat 3 or 4 inches deep or a bed is made 3 or 4 inches above the ground level in the open. A board is used to firm the soil down by pressing it lightly on the surface of the soil.

The seeds are planted directly on the firmed soil and sand is sprinkled on them lightly—just enough to keep the seeds from flying away in the breeze, however not enough to cover them. The seeds are covered with some fine rubbed peat about 1/8 or 1/4 inches deep. The soil is watered well and then the surface of the peat is watched. If the surface shows signs of drying, it is sprinkled lightly to replace the moisture. One quick pass with a sprinkling can every day or so should be sufficient. The seed bed should only be kept slightly moist. The seeds usually will germinate in 2 to 4 weeks.

After the seedlings are up, a sprinkling with a solution of thy-grow or other good liquid fertilizer every two or three weeks will help.

The bed or flat should be protected from heavy rains and partially shaded until the plants are about three or four months old. I find it is best to let the seedlings remain in the seed bed the first year as it is easier to keep them weeded and at one year of age they are larger and can be planted out more easily. The seedlings will keep growing during the winter if protected from frost and will give some blooms in two years if this is done. Three to four years, however, is the usual time required for them to mature to blooming size. They should be fertilized about 3 times during the growing season with a good organic fertilizer of a 3-9-9 or 4-8-8 mixture. The bed is allowed to dry out a bit between waterings after the first season. This seems to make them store food in the bulb rather than go to leaf growth.

You will find with the Dutch strain seed that you will get many very nice flowers and some outstanding ones worthy of naming. If you get an outstanding one, you should by all means show it in an accredited *Amaryllis* show. If it can win several times in competition, then surely

it is worthy of a name. If you have an outstanding seedling you should contact the registrar of the AMERICAN AMARYLLIS SOCIETY and get the name properly registered. The registrar is Mr. W. D. Morton, Jr., 3114 State Street Drive, New Orleans 25, Louisiana.

AMARYLLIS AS A HOBBY

W. J. PERRIN, *Louisiana*

Growing *Amaryllis* is without equal as a hobby. Very few undertakings are capable of holding year-round interest as does *Amaryllis.*

In the Gulf States area, starting February 1st and going through April we bring the *Amaryllis* cycle to a close with the blooming season. This is the time we take stock on the many details we have covered in the preceding 9 months; namely proper planting, fertilizing, location and summer care. At this time of year our thoughts are on the many spring *Amaryllis* shows and just how many flowers we will be able to show. Don't miss this important experience starting about February 1st, when flower buds start making their appearance.

Timing the flower for shows requires close study during this time. Without the aid of greenhouse, one has to keep close watch on temperatures and wind. A sheltered location similar to a back porch works very well. Fresh air and some sun is necessary to assure proper color of flower. When timing plants for late March and early April shows, a special check on progress of buds should be made about February 15th. Plants moving too slowly should be moved to a location where a higher temperature is available; moving plants indoors works very well. Care must be taken not to keep plants indoors too long as this will cause scapes to grow too long, and will reduce intensity of color in the flower. Warm water (to soil) used moderately, does some good toward bringing about bloom.

All are not show prospects, and it is not advisable to force the slow bulbs too drastically as many good bulbs are set back and shrink through forcing. It is hard to injure plants showing early foliage which indicates the root system has started growing. If you have never participated in Amaryllis shows don't miss the thrill of receiving that first blue ribbon. Your hobby will take on added interest immediately.

[Editorial note.—The above article is based on material published in Men's Amaryllis Club of New Orleans Newsletter, vol. 1, No. 6, January 1959].

GROWING PLANTS UNDER ARTIFICIAL LIGHT

CLAUDE W. DAVIS, *Louisiana*

Many plant lovers frequently feel the need for an inexpensive facility to be used in carrying tender plants through the winter months. They do not own a conservatory as a part of the home and the plants are not of sufficient importance to justify the cost of a greenhouse equipped

with a heating system, water and lights. The available window exposures to light inside the dwelling seriously limit the number of plants which may be grown during the winter months.

This problem may be easily solved by the use of fluorescent lights in any available room which has heat and space for plants. During the winter of 1958-59 the writer used a room, 8′ x 18′, which was built on one end of the garage and used as a storage and tool room. There were four small windows which did not give sufficient light for normal plant growth. Heat was supplied by a stove which burned natural gas and which was vented through one of the walls.

Additional light was furnished by stringing four, 48″, single tube units of fluorescent lights end to end over the plant bench for the length of the room. The 40 watt light tubes were connected in parallel. Home-made reflectors of sheet aluminum were bent in a semi-circle and attached over the top of each unit The units were individually suspended from the ceiling by dog chains which permitted raising or lowering of the light as needed for adjustment to plant growth. All material was purchased at wholesale at a total cost of $26.50 for the lighting equipment.

Lights were burned only during the daytime. The units were adjusted for height so that the light tubes were just barely above the foliage. Cost of operation was no greater than would have been experienced from burning a 160 watt light for the same length of time.

Plants were put in the hothouse in late October and kept inside until danger of frost was past in late March. The species which were thus carried through the winter were *Amaryllis* bulbs in pots, *Amaryllis* seedlings in flats, *Clivia*, seedlings of *Zephyranthes, Habranthus, Cyrtanthus* and *Lilium longiflorum*, a potted vine of *Passiflora coccinea*, a pot of *Allamanda* and a pot of *Eucharis grandiflora*.

All plants came through the winter in excellent condition, though most of the seedlings had become a trifle ''leggy''. The *Clivia* bloomed and the potted Dutch hybrid *Amaryllis* bloomed in February and set an excellent crop of viable seed. The Amazon Lily *(Eucharis grandiflora)* flowered for the first time in my experience and the tender *Allamanda* and *Passiflora* vines made considerable new growth. *Amaryllis belladonna, A. striata* and *A. evansiae* all flowered normally under these artificial lights.

Based on one winter's experience the change which I would recommend would be to install units with two tubes of light instead of single tubes. It is my conclusion that when adequate artificial light is provided that fluorescent lights will provide the energy for photosynthesis and normal plant growth.

GROWING AMARYLLIDS IN NORTH FLORIDA

BECKWITH D. SMITH, *Jacksonville, Florida*

During the years in which I have been growing *Amaryllis*, the fact has been brought to my attention many times that good established strains produce the best bulbs and the most beautiful flowers. The Dutch hybrids, notably the Ludwig, Warmenhoven, Van Meeuwen, Van Waveren, and Van Tubergen strains, have given us some magnificent Reginae and Leopoldii blooms. These strains provide unlimited possibilities for crossing the many individual clones. Certainly, they are valuable in the improvement of the Mead strains, prevalent in the Southern States.

Fig. 33. Hybrid *Amaryllis* clones as grown by Beckwith D. Smith at Jacksonville, Florida: Left, 'Fantasy' (Ludwig), rose and white. Right, 'Silver Lining' (Ludwig), salmon pink and white. Both flowered April 1959. Photos by Beckwith D. Smith.

In April of this year (1959), our *Amaryllis* beds were a blaze of color, such as we have never before had, and some of the hybrid clones literally outshone themselves in performance. We had the improved Mead strain from crossing with the Dutch hybrids, and the crosses between the Dutch strains. There were many solid colors, all shades of red and pink, some that approached lavender and wine, and numerous pastel shades and pure whites. Of named clones, the Ludwig collection purchased from Mr. Claude W. Davis, proprietor of the University Hills Nursery, Baton Rouge, Louisiana, in the fall of 1958, potted and placed in the greenhouse, produced bloom stalks from the fifty-three separate bulbs, and these, like the bulbs in ground beds, were all photographed in Kodak Ektachrome and Kodachrome color transparencies. The resulting color slides have provided a reincarnation of spring for us at any time we wish, and we can renew the pleasure of the blooming season for many happy hours when we have no blooms. The flowers that were most photogenic, according to selection made by Dr. Traub, are reproduced

herein in figures with a description of the clones in the captions. The named clones are Ludwig's 'Silver Lining' (Fig. 33), salmon pink and white; 'White Giant' (Fig. 34), white; 'Fantasy' (Fig. 33), rose and white. Also, Warmenhoven's 'Red Master' (Fig. 34), red, and Van Meeuwen's 'Alcyone' (Fig. 35), red; John T. Weisner's 'Dr. Robert

Fig. 34. Hybrid *Amaryllis* clones as grown by Beckwith D. Smith at Jacksonville, Florida: Upper left, 'Grace Primo' (B. D. Smith), light pink with green throat; named in memory of Mrs. A. Primo, the late noted amaryllidarian. Upper right, 'Dr. Robert Moon' (Weisner), light salmon, darker salmon (chocolate) throat. Lower left, 'Red Master' (Warmenhoven), a fine red. Lower right, 'White Giant' (Ludwig), an excellent white. All bloomed April, 1959. Photos by Beckwith D. Smith.

Moon' (Fig. 34), salmon with chocolate throat; and, lastly, my own origination, 'Grace Primo' (Fig. 33), an outstanding pink with light green throat.

A large number of our hybrid seedlings, the results of crosses from Dutch named clones, as well as Dutch on Mead stock, produced flowers

with varying results in form. Some were classed as Reginae and Leopoldii in form; some as striata, some in the Belladonna division, and some were just a moderate improvement over the Mead parent. One very beautiful seedling is a lovely white with slightly green throat, the flowers having a tendency to lift upwards. This bloom also possessed a delightful fragrance. We believe it is a worthwhile flower. The bulbs are rather small, but still put up two succeeding scapes. The pure white Mead reported in 1959 HERBERTIA, produced two scapes this year. The flowers were again a glistening white on the face. The reverse bore a little bit of brown color on one tepalseg. It was not visible unless light was placed behind the bloom. It is hoped this plant will eventually establish itself and become set in its habit of bloom.

Fig. 35. Hybrid *Amaryllis* clone 'Alcyone' (Van Meeuwen), a very fine red; flowered in April, 1959, by Beckwith D. Smith at Jacksonville, Florida. Photo by Beckwith D. Smith.

Some of our Dutch bulbs have surprised us by splitting entirely in two, so this happy result produced an additional bulb in each instance. Ludwig's 'Marie Goretti', a pure white, seems to have a strong inclination to divide in this manner.

As a result of having become an active member of the Louisiana Society for Horticultural Research by invitation in 1957, my share of the division of Amaryllids this year, which were grown in the greenhouses of Southwestern Louisiana Institute at Lafayette, Louisiana under the direction of Professor Ira S. Nelson, have added several to our species collection. Mrs. Smith and I are looking forward to their producing blooms after becoming established in our garden. From the

above source we obtained at least one each of the following bulbs: *Amaryllis belladonna*, Bolivian form; *A. reginae*, *A. evansiae*; *Habranthus cardenasiana*, a white Argentine rain lily, a pink Panama rain lily and a pink *Zephyranthes*. In addition to these bulbs the following delightful additions were made by Dr. Traub from his garden at La Jolla, California: *A. aglaiae*, *A. barreirasa*, and *A. aulica*; *Crinum americanum* (discovered at Beaumont, Texas), and *Crinum asiaticum*. *Hymenocallis kimballiae* (discovered in north West Florida); and *Vallota purpurea*.

The new species *Amaryllis*, yellow flowered form of *A. evansiae* from Bolivia, which we had already purchased in small quantity, is growing for us in a gratifying manner. It has bloomed for us this year and is an intriguing and fascinating flower. It will provide new genes for the *Amaryllis* breeder. This new species is now available in limited supply from growers.

With the rapid rate of growth we are experiencing this year with our *Amaryllis*, it is our hope that in another season some outstanding flowers will appear. We are constantly trying to improve flower form and color.

Fellow amaryllisarians from wherever they are may be certain of a warm welcome at any time to see the results of our efforts, and to discuss the cultivation of these 'beautiful ladies'. Our normal bloom season is during March and April.

ALLIUMS OF THE SOUTHWEST MIDLAND

THAD M. HOWARD, *D. V. M.*

I owe a great deal of my interest in collecting Alliums to the help and encouragement received from Victor Cory, former field botanist at Southern Methodist University, and now retired. The copious notes that he supplied have frequently proved valuable in tracking down a rare species across the State of Texas.

Allium elmendorfii.—In a limited region south and East of San Antonio, in Bexar and bordering Counties, is an "Island" of very sandy loam country known as the Carrizo Sands. Within this limited area grows the little-known *A. elmondorfii*. It is a tall fragrant species with white or pale pink flowers that do not open widely, giving the individual flowers a somewhat tulip-like shape. The umbel is fairly large in good specimens and often has twenty or more flowers, and the scape towers above the rush-like bluish green foliage.

The bulbs of this little *Allium* are tiny and have membranous coats instead of the reticulated coats found in most of the other native Alliums. They are characterized by the numerous little stalked bulblets which surround the base of the parent bulb. Oddly, the presence of these bulblets does not seem to hasten the development of large clumps, as one might suspect, as the parent plant is usually found growing singly or in very small clusters. Just how long many of these little bulblets remain relatively inactive before maturing is anyones guess. If they are re-

moved from the parent bulb and planted individually, they will all mature quickly. Nowhere common within its limited range, it may be found at the summits of sandy hills and along fences where they are safe from grazing cattle. Indeed, many Alliums and other bulbous plants are now to be found only along the fences bordering our highways since grazing and plowing have practically eliminated them from the rest of the area. I wonder what will happen to many of our native floral treasures in the years to come as all of our highways are widened, and these plants are unearthed from the places where they have sought refuge from progress to make their last ditch stand. The little Elmendorf *Allium* is a good example of a plant that is too specialized to compete for survival with cultivation and grazing. Being taller than most species (to 18″), it falls easy prey to cattle which easily decapitate the floral head before seed can be set.

When seen at its best it is one of our most floriferous *Allium* species. It is not unusual to find as many as six scapes springing from a single bulb. A few such plants in flower will give the effect of large clumps. It seems to do well in cultivation but must be planted in full sun in sandy soil in order to maintain itself. I doubt that this species will ever find its way into commercial avenues because of its peculiarities and unexciting appearance, though it might very well be appreciated by gardeners who like to collect and grow unusual Alliums.

Allium ruyonii.—In general appearance, *A. runyonii*, the "Runyon Onion" as we have humorously dubbed it, is almost identical with *A. elmendorfii*. Basically, the main difference seems to lie in the bulb coats of the two species, as well as their having different ranges in which they are found. Were it not for the fact that *A. runyonii* has reticulated bulb coats while *A. elmendorfii* has membranous bulb coats, I could not tell them apart. The Runyon Onion occupies an area midway between San Antonio and the Rio Grande Valley and grows in sandy loam that is heavier than the fine sand with which one associates *A. elmendorfii*. One would have to be an unusually intense collector to want both of these species in the garden since they are so similar. Even though the Runyon Onion grows over a much larger area than its cousin, it seems to be becoming even more rare. In retracing some botanical field trips made by Victor Cory in the early 30's and late 40's, I found that this species has nearly disappeared from its former habitats.

Allium ecristatum.—In this we find an *Allium* that could easily become a favorite with bulb collectors everywhere. Unlike the two preceding drab species, this one is refreshingly distinct and cheerful in its shades of lavender and pink. It has large white bulbs with reticulated coats, that quickly divide into nice clumps in a short time. A large colony of this *Allium* in full flower is an impressive sight and a rare one at that. Like the two preceding species, *A. ecristatum* has the misfortune of being tall enough to furnish browse material for cattle and so is becoming a vanishing species. Not at all common, it is to be found in low areas where water tends to stand after heavy rains. These flooded pastures do not hold water long enough to be classed as bogs, but the

heavy clay gumbo remains fairly moist during the growing season of this *Allium* and then becomes quite dry during the summer. In April, the 12″-18″ stems tower above the sprawling foliage bearing compact umbels of starry fragrant flowers in shades of pink and lavender. *A. ccristatum* is to be found in a limited area a few miles South East of San Antonio, and again farther south in the coastal prairie around Corpus Christi. It is easy to grow under cultivation if kept fairly moist during its growing cycle in the spring.

Allium perdulce.—In Northeast Texas near the Oklahoma border, one may come across a tiny and unusually sweet scented member of the *Allium* genus growing on sandy or gravelly prairies in early spring. Although many hesitant sniffers are surprised to find that many Alliums have fragrant flowers, the almost overpowering sweet scented blooms of *A. perdulce* may come as quite an awakening to the uninitiated. A group of these rosy-purple dwarfs in bloom will perfume a garden with a fragrance suggestive of lilacs. The short stems with their large florets nestled among the thread-like foliage arise from small reticulated coated bulbs and quickly form small clumps by division. Because of its earliness and its intense fragrance, the species should prove to be a very important addition to any collection of unusual bulbs.

Allium acetabulum.—This species was formerly known as *A. fraseri* and also incorrectly as *A. mutabile,* the latter name being properly a synonym for *Nothoscordum bivalve.* Apparently this creamy-white flowered species has passed through the 20th century under many synonyms so that some confusion exists. There are at least two other closely related species or subspecies that possibly may have been mistakenly or accidentally lumped under the same name or names. *A. acetabulum* itself is a very satisfactory garden plant with pleasing compact habit. While living in Arlington, Texas, in the spring of 1949, in the Dallas-Ft. Worth area, the writer first became acquainted with this little *Allium.* Bulbs collected ten years ago have continued to flower each spring and gradually increase in number. They grow in sandy open woods and open ground in the Eastern Oak Belt and West to the Red Plains and is said to be rather common. Although the flowers can be said to be fragrant, the scent is not as noticeable as some other species. *A. acetabulum* has the typical reticulated fibrous coats found in most of our native Texas Alliums. The individual flowers are small but numerous in the tightly compact little umbels that hover about 10″ above the bluish green foliage. It is not an exciting plant, but a pleasing one none-the-less.

In the hilly Live Oak area immediately North and Northwest of San Antonio grows a taller, slightly later flowering *Allium* which may be a different species or perhaps a subspecies of *A. acetabulum.* It too has creamy-white flowers which differ only slightly from the preceding species in minor characters. This one grows in rich heavy black loam in loose rocky soil in colonies scattered between the native Live Oak trees. It is fragrant, much more so than *A. acetabulum.* It is much more robust than that species and the bulbs have unusually heavy reticulated coats compared to other species. Being a late spring bloomer,

it makes a welcome addition to any *Allium* collection. Perhaps some day we will have it positively identified and find that it is a new species or perhaps only a geographical variety of *A. acetabulum.*

The Lakes Region of the Colorado River in Central Texas has yielded us an *Allium* that is close to *A. acetabulum*, but differs in several particulars. About the only similarity that it possesses with *A. acetabulum* is that it is a tall white flowered species having a slightly later flowering season. The individual flowers are creamier in coloration and open wider, displaying a white ovary in contrast to the green ovary of *A. acetabulum.* Victor Cory came across this new *Allium* several years ago while on a field trip in granite outcrops surrounding the Lakes Region and noted that unlike *A. acetabulum*, this new variety had only vestigial reticulated bulb coats which did not persist, leaving only the inner white membranous bulb coats in view. He described it as *A. fraseri var. eulae*, in honor of Eula Whitehouse who has done much to promote Texas wild flowers and who has also collected this species. This species, or sub species is confined to wet areas in the granite outcrops and in the tiny streams in this particular area of Central Texas. Only further study will reveal its worth as a garden plant. It will be interesting to find how well it adapts itself to different soils and moisture conditions since it seems to be a specialized plant. Now that the name *A. fraseri* is relegated to a synonym of *A. acetabulum*, perhaps this new variety with the membranous coated bulbs will be called *A. acetabulum var. eulae.* At this writing, having *A. acetabulum*, flowering alongside our tall white Bexar County species, this Central Texas stream-side species, I can't help but feel that all three are too distinct from one another to be "lumped" into a single species. Perhaps time and further study by one more qualified than I will solve the riddle.

Allium canadense.—It is difficult to discuss any native Alliums without mentioning *A. canadense* and its numerous varieties, though one would prefer to omit them. For the most part, *A. canadense* is a bulbil bearing weed. It is found in wet places over much of the State sending up its tall scapes containing a mixture of flowers, bulbils and green sprouts. In some individuals the bulbils are reddish and the flowers sometimes a bit more numerous so that an attractive appearance results in combination with the green sprouts in the umbel. It is not a plant to be introduced into the garden for the aerial bulbils scatter everywhere and it then becomes a noxious weed pest. I have found several varieties of this plant, but most texts list only a single species. Having grown and studied them in the garden, I personally feel that many of them could be classified, but apparently no one is that interested. Since they usually have a few or no flowers, the main character differences seem to be in foliage, robustness, etc., and geographical distribution. Usually the few flowers that may be present are white, but one subspecies *A. canadense var. parksii* has lavender flowers. It has no more garden merit than the rest of the lot.

Allium vineale.—Since we are discussing the weed plants of the genus *Allium*, we may as well mention *A. vineale*, the troublesome wild garlic from Europe. While living in Georgia, I found that this weed

ran rampant over the highways and byways in that state. It is said to grow into Northern Texas also. It is tall, wiry, and tough as nails. Once introduced into the garden it is almost impossible to eradicate from flower beds and lawns. The numerous tiny bulbils scatter everywhere. Actually, were it not so somber in color, it might very well be considered attractive in a few individuals which have more than the usual number of flowers in the scape. Being a garlic-type, it is edible and not unpleasant when used as a substitute for that herb, but it is too mild in taste and too small in bulb to offer any culinary competition.

Allium Hyacinthoides.—Getting back to the more pleasant and desirable *Allium* species, we may cheerfully enjoy the fragrant pink and lavender umbels of the early blooming *A. hyacinthoides*, from North Texas. In the Blackland Prairies of the Dallas-Ft. Worth area this *Allium* is fairly common. In early spring the squat little buds arise from the flat bluish foliage that hugs the ground, and lengthen to about 10" in the individual flowers which do not open widely but they are numerous, sweetly scented, and of a pleasing color. The large white coated bulbs with their faint reticulations increase very slowly but steadily by division and in time will form nice clumps in the garden. It is a pleasing garden species and very adaptable to cultivation.

Allium Coryi hybrid clone '*Margaret Kane*' (Howard).—Perhaps one of the most unique Alliums that I have ever seen is a hybrid of garden origin, between the yellow-flowered *A. coryi* and the pinkish *A. drummondii*. This plant was given to me by Mrs. Margaret Kane several years ago, since she knew that I was interested in Alliums. A few years earlier she had secured a few bulbs of *A. coryi* from a West Texas nurseryman and had planted them in her garden. After flowering, they set seed and went dormant, never to reappear. A few years afterwards she called me to come and identify a peculiar *Allium* in her garden that was in flower. The flowers were pale yellow with buff and pink markings. It grew several feet away from the old original planting of *A. coryi* which had since died out. Since she had a few clumps of *A. drummondii* planted in another part of her garden, we could only theorize that this plant was a chance hybrid seedling of *A. coryi* which had been fertilized by some insect with pollen from the pink *A. drummondii*. Mrs. Kane gave me the lone bulb and it has now increased to about a dozen bulbs by division. It sets seed but somehow I have always misplaced the seed that I have harvested from it so that as yet there are no living seedlings from this clone. It flowers later than either assumed parent and seems to be intermediate in color and habit. I have named this clone 'Margaret Kane' in honor of this gracious lady in whose garden this unusual hybridization chanced to occur. Perhaps some day I will have enough stock of this rarity to share with others. Although not as brilliant in color as the golden yellow *A. coryi*, the hybrid clone 'Margaret Kane' is much more reliable and longlived.

While collecting near the Rio Grande border in the mountains north west of Del Rio, I recently found an *Allium* new to me on the slopes of some of the rocky hills. These bulbs do not have the usual reticulated coats and the foliage is slender. This may prove to be the

autumn-flowering *A. kunthii* or some other relative. The wait to see it flower for the first time in my garden will be as interesting as the actual blooming itself. There are doubtless still other *Allium* species growing in Texas that I look forward to collecting some day. One of these is *A. stellatum* which is said to be an autumn-flowering North Texas species. There are a few Alliums in Mexico too, and perhaps someday these will also be available to those interested in this oft-neglected genus.

NERINE CULTURE

John T. Warren, in Gardeners Chronicle Vol. 146, page 18, 1959, gives the following directions for the care of Nerines in England: "Next month (August), nerine bulbs will begin to show signs of activity after being kept dry and exposed to full sun since the foliage died down in spring. Any repotting that may be required must be carried out just before growth begins. It must be borne in mind, however, that they do not require frequent repotting and, by and large, they resent disturbance at the roots; usually they are more floriferous when well and truly root-bound. An annual top dressing of new compost gives the roots a little fresh soil in which to ramify, and makes available just that extra little supply of plant nutrients for use when required; this job, too, must be carried out before growth restarts."

The American gardener interested in growing nerines should compare this procedure with that given by Emma D. Menninger for Southwestern America on pages 143 and 144 in 1959 Plant Life.

GREENHOUSE CULTURE OF AMARYLLIS IN NORTH FLORIDA

Beckwith D. Smith, *Jacksonville, Florida*

The sun is not too hot in winter to seriously affect the growing of *Amaryllis* seedlings under greenhouse conditions, and when it does get cold here (as it most always does, going down in the low thirties), your green house will afford ample protection through the use of a low voltage electric heater, and automatic ventilation.

A little more than two years ago I acquired an Orlyt aluminum and glass house, inside dimensions eleven feet by fourteen feet. It is equipped with manually operated sash on one side, and automatic motor driven sash on the other. Heat is supplied by a thermostatically controlled electric heater.

Last winter, this house was equipped with wooden benches, waist high, on the sides and in the center of the house. A light coating of lime paint was applied to the interior glass to reduce strong light on the young seedlings.

Pollinating of my Dutch *Amaryllis* was done in April and May when they bloomed, seeds were gathered in June and July and promptly planted in a soil mixture of sand and well rotted oak leaves, fortified with commercial sheep manure. This mixture was placed in wooden

flats, in which such crops as tomatoes, guavas and grapes are packed, which were obtained from local grocers. Seeds gave best results when planted flat, spaced one-half inch apart. They grew during the winter, fed on soluble liquid fertilizer, and by the beginning of March had well established leaves. It is to be noted that while in the greenhouse the little plants had even, uniform heat twenty four hours per day. Most plants had three leaves, with some of the reds producing four. Root systems were very vigorous, and when the young plants were set out in a new, raised bed last spring, all responded well, had little or no shock from being moved, and immediately began a healthy growth.

Watering during growth in the greenhouse was done with a fine mist spray. Plants grown in this manner look very well, having a glossy sheen, which indicates their satisfactory response with happy growing conditions.

Greenhouse facilities may also be utilized without the use of benches. In doing so the seeds are planted directly in beds at the ground level. It is, however, much harder on the individual to care for them in this manner as it is rough on the back and knees. The rewards of steady growth are fine plants, a jump of many months over the normal time required to grow bulbs outside, where they are subject to vagaries of changing weather. The uniformity of growth in the greenhouse greatly accelerates the ultimate time of bloom to which we all look forward.

Additional space, if any, in your greenhouse may be used for frost tender house plants. My wife is somewhat prejudiced against a jungle of plants in our house during the winter, so the comforts of the glass greenhouse are an ideal solution for keeping our prize specimens.

FIVE DISTINCTIVE HEMEROCALLIS

GEORGE GILMER, *Virginia*

Most of you like to have the finest in the popular shapes, sizes and colors and so do I, but I like some plants that are clearly different in some characteristics from the mass. I have eight fine, large, golden yellows. They have come from different breeders, but they are so much alike that if the labels were pulled off it would be impossible for me to be sure about replacing even half of them. I only want to keep two or three of them, but they are all so good and similar.

I have selected five from some 300 growing in my garden.

'Pink Ripples' (Russell) is the one in my garden I would hate worst to lose because I know of none like it. There are some I would prefer if I could grow but one variety. The petals are rippled or crumpled down in the heart of the flower. At first glance it might appear to be a double, though it has but six petals. It is a good pink with some yellow.

'Pink Lace' (Kraus) is the brightest day lily I have seen. It is a yellow-pink. But it reflects more light than any light yellow I know. It is not a white, but it looks to me like it has a good chance to be the ancestor of the first white day lily.

'Selena Bass' (Bright Taylor) is the best lavender I have seen. It has some blue in it, though far from a true blue. It may be one of the ancestors of the true blue we all hope to live long enough to see.

'Florence Clary' (Flory) is a good yellow with narrow reddish margin.

This is distinctly different from any I have seen except 'Jessie Shambaugh' and it is better than 'Jessie Shambaugh'.

'Skeeter' (Russell) is a miniature, melon pink. There are a lot of good yellow miniatures and some red ones, but none that I have seen or heard of that are melon pink.

No one would have any trouble distinguishing any of these from any others I know. It looks to one who does not breed day lilies, but has grown over 1000 named varieties during the last 30 years, that these would all be good for breeding.

In this list I would have included 'Captain Russell' but for the similarity to 'Mollie Gloye'. 'Captain Russell' has been a favorite for years. 'Mollie Gloye' has not been in my garden long enough to produce blooms on a mature plant. Both these are bicolors of lavender and soft light yellow, with wide petals.

AMARYLLIS ROUND ROBIN NOTES, 1959

MRS. FRED FLICK, *Chairman,*
Amaryllis Round Robins, Carthage, Indiana

[The following notes were extracted from Round Robin letters by the Chairman of the Amaryllis Round Robins.—*Editor*].

SUBJECT:—AMARYLLIS SEED SOWING AND CARE OF SEEDLINGS

MRS. JOSEPH ELIAS, CONN.—I use a very easy, lazy way to grow seedlings. As soon as the seed is ripe, I prepare bulb pans with broken crocks, moss and our regular potting soil of sifted compost and sand, with a six inch pot of bonemeal added to a wheelbarrow of soil. This is firmed down to within ½ inch of the top. The fresh seeds are laid flat, very close, until the surface is all covered. More of the soil mixture is put on top, and gently firmed down. The entire pot is stood in a pan of water until moisture shows on the soil surface. The pot is covered with a piece of newspaper and glass, then placed in a warm spot on a window sill.

As soon as germination starts, the newspaper is removed and the glass lifted. Surface watering is done gently when the soil looks dry. Then the little seedlings are on their own, along with the other plants. They stay in the original pan until after the first of the year, this when the seeds are planted in April or May. Then I give them more room in bulb pans. In June, all are set in rows in the garden along with older seedlings and flowering bulbs.

Feeding is done irregularly, but I know that a twice a month feeding would bring them along much faster. Blooms appear in from three to four years.

[Mrs. Elias has over 300 amaryllis bulbs to care for during the growing season.]

POLLY ANDERSON, CALIFORNIA.—I use pots of composty soil mixture with an inch layer of screened sphagnum on top. I place the flat seeds and cover with screened sphagnum. My problem has been to find a good medium in which to repot the year old seedlings. They like my seedling method, but seem to resent transplanting to soil afterwards. This year I have used some of the pressed peat pots and am transplanting earlier and using a very peaty soil mixture with the hope that I can plant pot and all into soil by the second year.

LYDIA PAHLS, FLORIDA.—I start amaryllis seeds in coffee cans, in a sterilized mixture of soil and gravel (grit or parakeet gravel), with enough peat moss to make a loose mix. The seeds are planted flat, well spaced, 7 or 8 to a can. The cans are covered with waxed paper. After they are up, they get an occasional feeding of Hyponex. In February or March, they are planted in the ground.

DICK GUERDAN, MISSOURI.—In planting amaryllis seeds, I prepare a flat with a sandy soil mixture, 1 part each of peat, sand and soil, mixed well. Seeds are planted individually with tweezers so that the seed stand on edge at a 45 degree angle. Then they are covered with sand until the seeds are covered. The flat is covered with a sheet of glass, or plastic until germination is nearly complete.

The plants are grown in about 50% sunlight and kept growing in the flat for about a year, or until the next spring, when they are individually potted.

I use any liquid fertilizer about once a month from the time the seeds germinate until the bulbs come into bloom when they are put on the schedule of mature bulbs. They must be shifted into larger pots as they grow, and usually bloom in 4's, or 5's, in from 2 to 3 years in the greenhouse.

When seeds are planted on the angle, the root seems to find its way into the soil more readily than when planted flat.

MRS. FRED FLICK, INDIANA.—I have not grown amaryllis from seed for some time. A number of years ago, I usually planted many seed each year; and even did some hybridizing with my very fine collection of bulbs. I have now lost all my Royal Dutch hybrids, and no longer let any seed mature.

I planted the seed in coffee cans, using a very loose mixture of soil, woods dirt, peat and sand. I placed the seeds flat, close together, and covered lightly with the soil mixture. As soon as the seeds germinated, the cans were placed in a sunny window.

During the second year, the little bulbs were repotted, using the same soil mix, but adding a little bonemeal, and old rotted cow manure. My seedlings bloomed from the third year to the fifth year. I had a few very nice ones from seed, and it was an interesting experience.

For some years I have grown my bulbs in Black Magic mix, and I believe this would make a good seed medium, though I have not tried to start seeds in it.

SPREKELIA FORMOSISSIMA IN NORTH FLORIDA

BECKWITH D. SMITH, *Jacksonville, Florida*

Sprekelia formosissima (AZTEC LILY, ORCHID AMARYLLIS), a native of Mexico, has been a trial to me for some years since it failed to bloom. I had seen it bloom year after year in Marianna, Florida in my Mother's bulb garden, where it was planted in a clay soil, and the winters were always very cold and the ground dry. However, when I started growing them in Jacksonville, where the soil is predominantly sandy loam, they grew well and multiplied vigorously, but refused to produce a single bloom. This was a puzzling situation and made me determined to find out why these sturdy bulbs would not produce flowers.

Upon asking various friends about their experience with *Sprekelia formosissima* in this area, they reported results similar to my own. This went on for several seasons. Meanwhile, I had tried fertilizing the bulbs, not fertilizing them, moving them from one location to another, watering and not watering, but without avail.

Last fall I was much discouraged and about ready to give up the culture of these bulbs. In the latter part of December, 1958 dug them all, allowed the tops to dry off and stored the cleaned bulbs in orange bags in the garage. The first of March this year all of the bulbs were replanted in beds, spaced four inches in the row. Soon they started to put out new foliage, and all during April put up bloom after bloom after bloom, until every mature bulb had produced at least one flower. It would therefore appear they require most of all a resting period after a good growing season, and I am setting forth this experience in the hope it will help other Amaryllid growers in this section to obtain similar results with these beautiful flowers.

During the winter a soil thermometer in the old growing beds registered a uniform temperature of approximately fifty degrees to a depth of about one foot. This might account for the fact that I was unable to get the bulbs to go dormant, as apparently they were continuing to grow underground during the winter season.

When hand pollination was attempted during last spring, I was only able to get one plant to set seed from fifteen blooms so treated, but this one pod produced thirty-six seeds which were planted, and three seedlings are now growing well in eight inch pots.

IMPORTATION OF AMARYLLIS BULBS

CLAUDE W. DAVIS, *Louisiana*

As has previously been pointed out in the columns of Herbertia, there are numerous pitfalls in the experiences of importers of Dutch hybrid *Amaryllis* from Holland. The most serious hazard is from cold. *Amaryllis* are tropical plants which are severely injured or killed if

allowed to freeze. The bulbs are shipped during the winter months and the bulk of the imports come through the port of New York where the shipment is frequently exposed to sub-freezing temperatures. The bulbs may be insured against loss from cold, but the effects frequently do not show up until the shipment has been distributed to customers throughout the country.

For three seasons, including 1958-59, the writer has imported *Amaryllis* for commercial purposes without loss or damage from cold in transit. The bulbs were packed in wood shavings in heavy paper bags. These in turn were in heavy wooden boxes which were lined with a double thickness of heavy felt. Thus protected it would have required a long exposure to very severe cold to have adversely affected the bulbs.

The two most serious difficulties are the complete loss of functioning roots and sweating of the bulbs while enroute.

Bulbs for the fall shipment are harvested in October and allowed to cure for a month before export in November. The average time lapse to destination is five weeks. It may be longer if the forwarding agent in the port of entry holds the bulbs in storage during a period of cold weather. Even if they move promptly through the port there is an average time lapse of nine weeks between harvest and receipt of the bulbs by the importer. No root system could survive such treatment. When the bulbs are potted and given moisture and warmth they often send up a bloom scape and flower before new roots appear. This so weakens the bulb that two or more growing seasons are required for the bulb to make sufficient growth to flower again. The first objective of those who acquire newly imported bulbs is to stimulate new root formation.

There is still considerable moisture in bulbs shipped in November, even though they have been cured for a month. When tightly packed for shipment the bulbs sweat heavily during the five weeks in transit. This sweating causes portions of the outer scales to slough off, giving the bulbs an unsightly appearance and causing many purchasers to fear that their bulbs have been frozen. Actually, the bulb is not seriously injured by this sweating, although the loss of any of the scales reduces the strength of the bulb.

Cold damage, the loss of functioning roots and sweating in transit all tend to cause dissatisfaction among the customers of importers, but unfortunately the named clones of the Dutch hybrids are not produced commercially in the United States and these are hazards which must be expected by the importers and their customers who wish to grow the Dutch clones.

GARDEN GLEANINGS FROM CINCINNATI

LEN WOELFLE, *Ohio*

After what seemed to be a record-breaking winter here in the Middle West, one of the wettest springs we have had for a long time, and then most definitely the hottest summer we have ever had with heat records being broken day after day, it is strange that we should have enjoyed better bloom from many bulbs than we had for years.

Winter settled down early and stayed late, with many mornings of zero temperatures, and days remained cold. Shelves in the basement of my home where most of the tender bulbs are stored over winter showed temperatures around fifty degrees where normally they were ten to fifteen degrees warmer.

When spring came, results were immediately apparent. Trees and shrubs seemed to grow beautifully, just loaded with foliage. Perhaps this was an illusion. Perhaps after the severity of the winter we were a little more appreciative of the niceties of spring. The spring bulbs seemed to bloom more beautifully because they were not forced too early from their winter's sleep.

Then the rains came. Fortunate indeed was the gardener who was able to get everything planted during that brief dry period in early May. It was nearly mid June before the ground was again tillable. *Amaryllis, Sprekelia, Zephyranthes,* tried in vain to bloom in their storage bags, only to have the buds blast as they pushed up out of the bulbs, starving for a lack of food and moisture. I just winced as bulb after bulb was taken out of the bags to be planted, with the dried buds hanging limply from the neck of the bulb.

But there were compensations. The hardy shrubs and trees of the area seemed to bloom more profusely than ever before. The red-buds and dog-woods just seemed to run rampant with bloom over the hills.

In the gardens the Magnolias, flowering crabs and cherries were virtually each plant a giant bloom.

Many of the *Hymenocallis (Ismene),* to which I particularly look forward each spring for bloom, pushed up weak watery blasted bud sheaths, delaying for a year perhaps the bloom so eagerly awaited. But once planted they seemed to try doubly hard to make up for the loss of bloom by producing beautiful, profuse foliage, and seemed to give promise of a better spring to come.

The summer was hot and dry, but the garden sprang to life with each shower with more than generous bloom from the *Zephyranthes.* There was hardly a day when there was not some one or more of these miniatures proudly holding its welcome bloom into the heat of the boiling sun. Outstanding among the *Zephyranthes* were *Z. clintiae,* Howard's *Z.* Valles spp., and an unidentified yellow collection by Mrs. Clint, bearing her accession number M-449. *Z. brazosensis* and *Z. smalli* did more than their share to brighten the garden.

Lycoris squamigera brightened the scene after not having bloomed for four or five years, and the genus *Lilium* although suffering from the heat did its share.

Now with summer fast growing to a close, *Rhodophiala bifida* and its varieties are giving superior blooms. The *Zephyranthes* on this the tenth day of September are still giving spasmodic bloom and I hope with favorable weather conditions they will still give one more burst of flowering before digging time in mid October.

Now it is time to get busy with the seed catalogs, to obtain seeds of perennials, and bulbs for spring bloom. With a bit of nostalgia we close the pages on another summer in the garden, and condition ourselves to the long winter wait for another year. What will the next season bring? A gardener always has something to look forward to.

MOVING DAY FOR AMARYLLIDS

JOSEPH C. SMITH, M. D.

In 1958 the author bought a new home, and it became necessary to move his large collection of amaryllids. Before the purchase much thought was given to the timing of the move in order to disturb to the least possible degree the growth cycle of the numerous genera of amaryllids being grown. Mid-winter was decided upon as being the time when the largest number of genera would be resting or dormant in this area. However, many genera are winter growers such as the *Brunsvigia*, *Lycoris*, *Cyrtanthus*, and many of the nerines. It is to be hoped that one never has to make such a move. It is disheartening to have to wait for amaryllids to reestablish themselves and to come into bloom again. How the move was accomplished may be of aid to some other unfortunate collector whose wife decided that the family needs a larger home, and he has to move his well rooted collection.

In mid winter the move for *Amaryllis* was no problem. They were all dug and dried, bagged and labeled in the late fall. Paper bags were used for storing the bulbs and the name was written on the bag so there would be no labels to get lost. Digging began in October as the bulbs began to go dormant. Thorough drying was accomplished before any quantity of bulbs was piled together. This is easily done in a few days in our drier type climate. The bags were not crowded together but left setting around a large garage with space between until near moving day when they were finally packed in heavy wooden boxes that would not allow the bulbs to be crushed by other things being piled on top of them. The curing process should include the removal of all soil and treating with insecticides to insure leaving all parasites behind if possible. This is the one big advantage of a move if one has to be made. The new location will probably be free of pests if no amaryllids have been grown there previously. The author was lucky in getting a place where nothing had ever been grown under cultivation before, desert land with not even a strand of Bermuda grass.

Many of the species *Amaryllis* were in pots in the greenhouse and these were moved along with the entire contents of the greenhouse by

crowding the pots as close together as possible on the truck floor and on racks made of two by fours and plywood. The greenhouse itself being of light weight construction, redwood and sheet plastic, was loaded on the bed of a large truck and transported that way. This method of transportation took care of all the genera of amaryllids that are normally growing in winter and had to be potted up to allow continued growth. This included most of the *Lycoris* with the exception of *L. squamigera* which had not put up leaves by January first and these were just dug and replanted again in a few days without drying off. It was found that *Lycoris* can be dug and potted up as they start growth with little harm if a good root system is preserved. Later the pot contents were emptied intact and planted in their new location with continued growth of the foliage. Even with this care no bloom occurred the next fall.

Due to a dry fall the *Brunsvigia* species and hybrids had been slow in starting growth. When they were dug with as much roots as possible a few days before the move on January 4th they had leaves only three or four inches long and were replanted as soon as possible in their new site with care not to dry them any more than possible. This caused a poor show of flowers the following August and September. The winter dormant nerines were dug and stored until convenient to replant. They flowered excellently the next summer. The winter growing nerines were potted up during the fall and many bloomed in the pots. The *Cyrtanthus* were dug early and held dormant until after the move when they were planted at once and flowered normally. The one *Ammocharis* bulb on hand had not finished its reversal of growing season for the northern hemisphere and had grown all summer. So it was dug and dried off. When replanted in March it did not begin growth until August. The same delay took place with *Amaryllis immaculata* and this is certainly a nerve wrecking experience wondering if they are ever coming out of dormancy.

The deciduous *Hymenocallis* were no problem in a winter move. The Ismene group rather enjoys a move to a new location and more fertile soil. The evergreen species of *Hymenocallis* were dug, dried, and stored. Some were held in storage as long as four or five months but have been slow to regain vigor. Actually they were dried out too much and would have been much better if held in a humidity controlled type storage to prevent shrinkage of the bulbs. *Pseudostenomesson, Urceolina,* and *Calostemma* were dried off though they are normally in growth at this season of the year.

Though many of the crinums grow through the winter here they were dug and dried and replanted as convenient during the rest of the winter. Most made good growth and bloomed satisfactorily in season. *Crinum* clone 'Cecil Houdyshel' really showed off by sending up three scapes in succession much earlier than it usually starts to bloom. *Crinum asiaticum* with its stiff upright evergreen foliage was wanted in the landscaping so it was dug and replanted quickly to avoid loosing the foliage. The x *Crinodonna* bulbs were dried off and replanted later although this was their growing season, and as a result they flowered

poorly the next summer. Something had to wait and these are vigorous plants here and could take it.

The *Clivia* plants were dug in clumps and replanted at once. By this method they flowered normally in February and March some repeating in July. The evergreen *Haemanthus* were also handled in this manner. The deciduous species were stored dry. The distance moved was only five miles making it possible to run back and forth frequently to transport quickly plants that were not to be dried out. Fortunately not many *Narcissus* were involved in the move as this would have been a very inopportune time to attempt to move them. A few 'February Gold' and jonquils were potted up and moved as the *Lycoris* were handled. The *Agapanthus* were moved in clumps some being replanted at once and others waited their turn until they were semi-dry. The *Tulbaghia* clumps were handled the same as the *Agapanthus*.

Rhodaphiala had been potted up in the fall as they started their growth and replanted from the pots. They performed beautifully the next September. All *Sprekelia, Habranthus*, and *Zephyranthes* were stored dry and replanted in the spring. *Chlidanthus* was handled like the Ismene. Pancratiums were handled as dry bulbs. *Eucharis* and *Eurycles* went as potted evergreen plants as did also *Vallota speciosa*. Most of the seedlings of the different species were being grown in the greenhouse as potted plants and went with the contents of the greenhouse. *Stenomesson* were dug and dried.

Some genera of amaryllids may be dried off and held in storage as long as three seasons before replanting if they are kept from drying out until nothing is left. Moving a collection is quite a chore and there is no one season best suited to all genera of amaryllids. It is hoped that the way the author solved the problem of when to move a collection of amaryllids will be of help to others faced with moving all genera in one season.

AMARYLLIS FOR BEGINNERS

Robert D. Goedert, *Florida*

One look at a well grown *Amaryllis* often makes an ardent fan. The beginners can hardly wait to try their hand at flowering one of these beautiful and fascinating bulbs.

The first season he gathers every catalog he can find and reads every article he can get his hands on about *Amaryllis*. Even with this information he often has poor luck at flowering his first bulb and more often it does not flower at all the second season for him. The new fan often is led to believe that flowering amaryllis year after year is a relatively easy matter. This is not true as they apparently have very exacting requirements for maximum performance. Most of the varieties on the market are hybrids. These hybrids were developed from several species with different cultural requirements. It is therefore very difficult to predict just what cultural conditions will give satisfactory results for a particular variety. The Dutch growers have possibly perfected the

culture of *Amaryllis* to the highest degree. From my dealings with them I often hear complaints that this variety or that variety just did not do well this season. Their prediction of the crop is often wrong. For instance, in 1958 I was told that the *Amaryllis* crop would possibly be poor due to cloudy weather in the Netherlands. However, at the end of the season one larger grower told me he was surprised as the *Amaryllis* had made exceptionally good growth and the bulbs would be extra large.

Many very successful *Amaryllis* fans who consistently win ribbons in the various shows find that they have extreme difficulty in growing a certain variety. I believe this indicates that some *Amaryllis* clones have more exacting cultural requirements than others. I find that a clone that often does well in the north does not perform as well in the south. This is particularly true with the clone 'American Express'. Undoubtedly the condition and composition of the soil, temperature, watering and other cultural factors play a large part in their performance. I find some clones generally appear to grow more satisfactorily under more varied conditions than others.

INFORMAL EVALUATION OF CLONES

I maintain a rather large collection of named hybrid Dutch *Amaryllis* clones. They are grown both outdoors in the border and in pots. My purpose is to pass on particularly to the new *Amaryllis* fan, a few comments on the different hybrid Dutch clones that have performed well for me and for others from whom I have heard in different parts of the country. I have tried to arrange my comments so that you may pick out a particular color shade easily. First I will comment on the whites, then progress through the pinks and whites to the pink or light rose shades. I will then comment on the rose colored clones as they get darker ending with the wine reds. After this I will take up the red clones starting with the very dark reds and continue as they get lighter to orange red and ending with the salmons.

The white clones possibly, as a group, are the easiest to grow. This is due to two facts. One is that these clones stem from a more common ancestry and the different clones thrive under more nearly the same requirements. They also were given particular attention by early hybridizers and possibly better selection of seedlings has been made. Most of these are tried and proved clones having been on the market for a considerable time. I find 'Albino', to be exceptionally easy to grow. It can be maintained in a flowering condition year after year and often will give three spikes. Ludwig's 'Marie Goretti' is very fine and is delightfully fragrant. It has wavy tepalsegs. It is vigorous and very satisfactory. Warmenhoven's 'Mt. Tacoma' is easy to grow and is a very tall plain tepalseg clone that will grow larger than its normal 7" under good culture. 'Ludwig's Dazzler' has less green in the throat than most others. It is an excellent show flower and is of easy culture. The new 'White Christmas' (Van Meeuwen) may turn out to be the giant of the whites. I received many fine comments on it last season. It appears to be most free flowering and surely will make itself known

at the shows this season. 'Nivalis' and 'Bridesmaid' are very popular in certain show areas.

In the white and pink class two are outstanding: Warmenhoven's 'Beacon' and Ludwig's 'Love Desire'. 'Beacon' is very flat and salmon pink with white mid-rib. It flowers very large consistently. It is in a color class all its own and has no rival. 'Love's Desire' is truly beautiful and is relatively easy to grow. It should become increasingly popular. 'Apple Blossom' is another good clone. It is flatter than 'Love's Desire' and a vigorous grower, but its color is not as refined in my opinion. It tends to a striped variety rather than a blended color. Van Meeuwen's two new ones, 'Zenith' and 'Volendam', are very interesting and deserve watching.

There are not many red and white two-toned or striped clones. 'Five Star General' is possibly the most outstanding. It should be in any good collection of *Amaryllis*, but it is a slow grower and only flowers well from large bulbs. It could not be recommended to the beginner. Ludwig's 'Silver Lining' is more of a striped clone than 'Five Star General'. It generally flowers larger and much easier. It is possibly the largest striped variety and is very outstanding. Bulbs of both of these have been scarce. 'Five Star General' will be more plentiful next season; however 'Silver Lining' will be scarce for several years until stocks are built up. 'Candy Cane' is an easy grower and has a good color pattern, but it is an orange red which some object to. The new 'Circus' is darker red and very much like 'Candy Cane'. It is too new to recommend to the beginner but may replace 'Candy Cane'. 'Clown' is a distinct striped clone that is a little "rassel dazzel" and appears to be a vigorous grower from one years experience. Men, generally, will like this variety as it is powerful and fiery.

The picotee clones seen so far possibly fall in the two-tone red and white class. This one is too new to evaluate properly but deserves comments. They have a rather airy form and are surely something new in *Amaryllis*. They are a group of selected seedlings rather than a clone. Some variation in flowers will be found in the different forms of it; however all are surely worth while. The margin of the tepalsegs have a narrow bright red border and the rest of the tepalsegs are often spotted and flushed red. They are exceptionally beautiful and interesting. They grow rather slowly, but the bulbs will normally make two spikes from rather small sizes. The size of the flower varies with the size of the bulb to a marked degree. This coming season, 1960-1961, only about 400 bulbs will be available. It will possibly be scarce for many years.

In the pink and rose shades 'Daintiness' is outstanding in the lighter shades. It grows easily and makes large flat blossoms. It is an exceptionally fine clone. 'Siren' is not quite as refined in color, but is possibly the most vigorous grower of all the Dutch Hybrid *Amaryllis*. It is surely one for the border in the south. It also appears to grow well in full sun as I have seen it growing well where there was no shade. 'Margaret Truman' which is a little darker in color grows well in my border and elsewhere. 'Pink Favorite' is a giant rose pink that grows easily. There are a number of new ones that fall in this class which

should be watched. Two are Van Meeuwen's 'Queen of the Pinks' and 'Queen of Sheba'. Van Meeuwen's pinks run somewhat to the salmon shades. Ludwig's new 'La Forest Morton', 'Spring Dream', 'Prima Donna' and 'Ludwig's Ace'' can be expected to give competition to the older ones and will surely prove to be worthy additions to this color class. In still a darker shade we find 'Doris Lilian' which grows flat and round. It is not an extremely large flower but very outstanding in performance. 'Diamond', still darker, is more of a rose red. It also is easy to grow. Warmenhoven's 'Moreno' and 'Mysterie' grow vigorously for me. They are more of a fuchsia or light wine red. These two have a lavender cast. Both 'Moreno' and 'Mysterie' will grow tall and large. They have more of a triangular shape than the others mentioned in this color class.

If we continue in the dark rose colors, Van Waveren's 'Modern Times' should be mentioned. This is relatively new in a semi-trumpet shape. Its deep rose red color is outstanding, and from one year's trial it appears very vigorous. In the dark wine color 'Tristan' is possibly the best all around clone. It grows easily. Warmenhoven's 'Red Master' is a similar color. It grows much larger and is considered to be one of the most outstanding *Amaryllis*. It however is somewhat temperamental. It usually flowers exceptionally well the first year, but it is hard to maintain in a flowering condition after the first year. The tepalsegs of 'Red Master' grow after the flower opens. It may look ragged when it first opens but after a day or so the tepalsegs broaden and the flower becomes very large and beautiful. Often it will grow to 11" and larger. Before we leave this color class, Warmenhoven's new 'Purple Queen', should be mentioned. This may prove to be the darkest in this particular color class.

In the dark red, although new and not yet proved, 'Ludwig's It' must be mentioned as it surely was the sensation of the 1958-1959 season. 'Cardinal' and 'Fire Dance', both clones that I named, also received good reports last season. Of course one season can not determine a clone's worth but these three, I predict, will become leading reds. They will, however, be scarce for several years until stocks can be increased. Of the older tried clones, 'Peacefulness' is surely reliable. 'Queen Superior' is a classic old clone that is still one of the best dark reds and will be with us for many more years. 'Wyndham Hayward' is a reasonably good growing plant especially for late flowers. It and 'Ludwig's Dazzler' stay dormant in storage much longer than many others and apparently can be flowered successfully after the weather becomes warm and others do poorly.

'Brilliant' in the medium red color, grows strong in the border. 'Ludwig's Scarlet' is outstanding. 'Scarlet Beauty' and 'Scarlet Triumph' grow large easily. 'Faust' is a good old bright scarlet clone. Van Waveren's 'Red Champion', although new, appears to be very worth while. It will make a mass of blooms as both scapes often flower at once.

Before the orange clones are mentioned, 'Fabiola' should be touched on. This is a good bright red with a rosy shade in the throat. It is much like the old 'Imperator'.

'Attraction' is a good rusty orange red. The tepalsegs roll back in this variety which adds to its charm. 'Don Camillo', somewhat lighter, is a fine flat pansy faced variety that is exceptionally beautiful and grows satisfactorily.

In the bright orange or mandarin red shades, 'House of Orange' is outstanding. It is a beautiful ruffled variety of Van Waveren's and appears to be easy to grow. Still lighter in color is 'Delilah', a light orange or salmon orange. It flowers well after it is established but often poorly the first year. In the salmon orange to buff shades 'Queen's Page', 'Salmonette', and 'Pinksterflower' are very good. 'Camellia' (Van Meeuwen) is partially double and may prove to be very worthwhile.

Last I will mention one of the most unusual *Amaryllis*. This is Ludwig's 'Bouquet'. It is a most beautiful begonia pink with purple mid-rib. It grows easily in the border as well as in pots. It is surely recommended to all beginners.

In closing I would also like to mention the Gracilis group and other small clones and species. These are certainly worth your consideration. They usually make lots of offsets and are generally easier to maintain in flower than the larger ones. They are particularly good house plants. The scarlet-flowered species, *Amaryllis belladonna* L. (syn.-*A. equestris)* from the West Indies, Mexico, and South America, now cultivated in Florida, India and elsewhere has a small bulb and can be planted several to a pot. It gives a nice display of flowers and the pot of green foliage is also appealing. These and others in this class should have more of our attention.

BUD INJURY BY THRIPS

Although I did not intend to touch on the culture of *Amaryllis* I would like to mention one thing that is seldom found in cultural instructions and can surely result in great disappointment to the *Amaryllis* fancier when his flowers open scarred and mottled. Certain thrips are attracted by *Amaryllis*, they often winter over on stored bulbs. If you purchase new bulbs, a little D.D.T. dusted on them when they are received or at planting time will usually eliminate trouble from this insect (see also page 185, Traub—AMARYLLIS MANUAL, Macmillan. 1958, for further information). Do not take this advice lightly as this insect can surely ruin your flowers. Last year I visited a garden that was heavily infected and the good lady was frantic that the sun was burning her flowers. She had never heard of thrips and only after I had shown her this tiny insect did she realize fully what had happened. D.D.T. will usually give good control and normally in most areas of the south this insect does not become bothersome if the bulbs are not dug and stored.

EURYCLES CULTURE

William Morris, *New South Wales*

Eurycles amboinensis is common to the tropical scrubs (jungle) of Australia between Cooktown and Townsville in Queensland. It grows during the autumn and winter and goes dormant in July or August. The flowers show in November. The bulbs are found in soil rich with leaf mold or straight humus. Since the plant is extremely tropical seeds are hard to come by unless conditions are near ideal.

Eurycles cunninghamii grows near Grafton, N. S. W., where conditions are a bit cooler. The bulbs are found in leaf mold amongst broken rock under jungle conditions. This species has a long summer dormant period and like *E. amboinensis* throws its foliage in mid January. In my garden here in Warner Bay the plant seeds occasionally. I would like to exchange *Eurycles* seeds for species *Amaryllis*, especially the recently described yellow forms. My address is 20 Mill Street, Warner Bay, N. S. W., Australia.

MINERAL DEFICIENCY AND MOSAIC DISEASE IN AMARYLLIDS

Hamilton P. Traub, *California*

A number of inquiries have been received recently from growers asking about symptoms of *Amaryllis* mosaic disease. These symptoms, according to Brierley (1948) are recognizable by irregularly distributed light and darker green areas in the leaves, and in *Amaryllis* the "pattern is a coarse one, with large patches of yellowish-green appearing at random over the surface. The yellowish-green areas have irregular margins, and shade into the normal green areas without a well-defined line of demarcation. There is little distortion of the leaf in *Amaryllis*, and the affected plants are not conspicuously reduced in vigor."

In all cases, the leaf samples submitted to the writer were definitely not those of mosaic but showed irregular light green and somewhat deeper green areas. The writer has also observed similar symptoms on his *Amaryllis* at La Jolla when planted in one area at his home. It appears that in this portion of his yard there had been a fill-in of heavy clay. When *Amaryllis* bulbs were moved to a better location, the light-green and dark-green leaf symptoms disappeared. Thus it was shown that mosaic disease was not the cause.

Mr. Jack Scavia sprayed the soil around the *Amaryllis* of part of the filled-in area with diluted "Agra-Green", a liquid originally containing a 15-6-4 fertilizer solution, including also 0.1% each of copper, zinc and iron (added by the maker as sulfate). The dilution used was 2 tablespoonfuls per gallon of water. The new growth on the *Amaryllis* did not show the light-green and dark-green leaf symptoms in the sprayed area. However, since the rest of the field was not treated with

a similar diluted 15-6-4 fertilizer solution without the minerals, it is not possible to say positively that either the copper, zinc or iron applied cured the plants since the fertilizer may have been responsible.

At present it is not known what chemical element or elements are missing or locked-up in the filled-in location. Some of those submitting affected leaf samples assumed that the symptoms might be due to iron deficiency if mosaic were not present, but this has not been proved. Diseases of plants and animals are caused by adverse external and internal environmental conditions which include also the ravages of plant pathogens, viruses or animal parasites; or any combination of these. Proof of the cause or causes of any disease is established when the disease or diseases can be initiated by any particular condition or conditions as indicated above, and when the disease or diseases can be cured when the causal condition or conditions are removed. Amateur gardeners who write about diseases should keep this in mind when reporting their results.

The case for mosaic disease in *Amaryllis* and other amaryllids at present rests on the fact that the disease cannot be cured in the affected stock but it is not seed transmitted. Thus mosaic-free seedlings can be grown from mosaic-infested stock (Brierley, 1948). So far all attempts to cure infested stock has failed, and also it has not been possible to transfer the mosaic virus from diseased plants to other mosaic-free stock by experimental techniques in the laboratory (Brierley, 1948). Under natural conditions, it is assumed that the virus is spread by insects and mites, but how this actually happens is still unknown.

Further controlled experiments are needed to clarify the subject of mineral deficiency and mosaic diseases with reference to *Amaryllis* and other amaryllids. Colored illustrations are needed to show the actual leaf patterns for mosaic disease and for the various mineral deficiencies. Thus it will be possible to distinguish easily between mosaic disease and the mineral deficiencies.

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POSTSCRIPT.—Prof. Ira S. Nelson writes under date of December 3, 1959, that Dr. Kahn of the U. S. Department of Agriculture is investigating mosaic disease in *Amaryllis* and other amaryllids. This is good news indeed.

Anyone having *Amaryllis* or other amaryllids suspected of being infected with mosaic disease should send samples to: Plant Pathologist, Section of Mosaic Diseases, U. S. Plant Industry Station, Beltsville, Maryland.

AMARYLLIS AULICA FROM SANTA CATARINA, BRASIL

JOSEPH C. SMITH, *M. D.*

In 1958 Prof. P. Raulino Reitz of Itajai, Brasil sent bulbs of an *Amaryllis* species that grows on the trees of the rain forests of Santa Catarina Province. These bulbs did not look unusual in any way and were potted up in a soil mixture heavy in peatmoss mainly to provide as good drainage as they must get in the crotches of trees. Soon the leaves began to appear and these were noted to have a reddish cast to them. They were keeled all the way to the pointed tips. Growth continued from the July planting date throughout the winter to the next July when the foliage declined and the bulbs went completely dormant for two months. In September the new leaf tips started showing and when they were four inches high the bud tip also began to show. The foliage, eight leaves at once, grew steadily to full size but the scape lengthened slowly and opened slowly so that the plant was in full leaf by the time the flowers were out.

The flower was outstanding in that the petsegs were wider than the setsegs which is the reverse of the usual condition in *Amaryllis.* This reversal of parts will be valuable in breeding experiments if it transfers to the hybrids where it would tend to widen the lower petseg. The umbel was 2-flowered as usual and the flowers were lively aulica red with a dark red signet ring around a pronounced incurved paraperigone at the apex of the tepaltube.

This specimen was donated to the TRAUB HERBARIUM therefore no record of fertility and seed production was obtained this season. This species has proved easy to handle as a pot plant and should make an interesting addition to any *Amaryllis* collection. The writer wishes to thank Director Prof. Reitz for his kindness in donating this interesting *Amaryllis* species from his Country for our study and enjoyment. Other bulbs that he sent this year will be reported on as they bloom and are identified. We are particularly anxious to see the flower of an *Amaryllis* species he sent labeled "rose-colored".

CRINUMS FOR EXCHANGE

Mr. Mat Waltrip, 5406 Willow Bend Blvd., Houston 35, Texas, writes that his hobby is the collection and study of Crinums. His collection now contains over 50 items, and he wishes to exchange seeds and bulbs of *Crinum* and other amaryllids with others here and abroad.

PLANT LIFE

VOLUME 16

[Nos. 2-4, incl., Apr., Jul. & Oct.]

1960

General Edition

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THE AMERICAN PLANT LIFE SOCIETY

Box 150, La Jolla, California

PREFACE

The Centenary of the publication of Darwin's *Origin of Species* (1859) was the occasion in 1959 of the publication of a number of important books on the development of the evolutionary concept before and since Darwin. One of the outstanding books in this class is *Forerunners of Darwin*, edited by Bentley Glass, et al, in which authorities present stimulating essays on the subject. In one of these essays by Bentley Glass, the forgotten fact that Michel Adanson is the true founder of the natural system of plant classification, and the foremost botanist that France has produced, is brought to light. It is pointed out that "The reasons for Adanson's eclipse and the neglect of his work appear to lie, like those relating to Maupertuis, in the machinations of an evil genius, in this instance his rival Antoine Laurent de Jussieu, who through nepotism succeeded his uncle as director of the Jardin des Plantes and successfully devoted himself throughout his life to the derogation of Adanson and the enhancement of the reputation of his uncle."

To remedy this neglect in part, THE AMERICAN PLANT LIFE SOCIETY will sponsor the publication of English translations of Adanson's works so that the English readers generally may read about the facts themselves. Thus, the Bicentenary of the publication of Adanson's *Familles des Plantes* (1763) will be celebrated in 1963 as indicated in this issue.

In addition, Dr. Corliss reports on his European trip in 1959, and Dr. Uphoff completes the review of the genus *Gagea* in the present issue.

January 15, 1960
5804 Camino de la Costa,
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[**PLANT LIFE LIBRARY,** continued from page 74.]

recent advances in the field. The subject matter ranges from atoms, light quanta, and ionic solutions, through biological macromolecules, tissues, and ultrastructures, to sensory mechanisms and signal processing by high neural centers. The emphasis is on the all-over unity of biophysical science, the interrelations of its many aspects, and the essential role of biological specificity, organization, and mutual interaction at all levels of biological organization. This is required reading for all biologists.

SYNTHESIS AND ORGANIZATION IN THE BACTERIAL CELL, by E. F. Gale. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1959. pp. 110. illus. $3.50. These 1959 CIBA Lectures in microbial Biochemistry were presented by Dr. Gale at the Institute of Microbiology, Rutgers University. The theme of the lectures is biosynthesis with emphasis on the synthesis of proteins and nucleic acid. The first part is concerned with the bacterial cell, its structure and organization; the second part, with the mechanism of protein and nucleic acid synthesis, one of the few remaining problems in biochemistry. Highly recommended.

[**PLANT LIFE LIBRARY,** continued on page 162.]

ADANSON BICENTENARY, 1763—1963

The year 1963 will mark the Bicentenary of the publication of Adanson's "Familles des Plantes" (1763). Émil Guyénot (1941) has pointed out that Adanson is to be recognized as the founder of the natural system of plant classification and that he ranks as the greatest plant scientist France ever produced—a man at least the equal of Linnaeus in genius. According to Glass (1959), Adanson is one of the forerunners of Darwin: ". . . we are scarcely in error if we grant that his [Adanson's] achievement of a truly natural classification based on real affinities, his emphasis on the variability of species and the analysis of mutant forms, his suggestion of the causes of hereditary variation, and his emphasis on fossils as indicating the demise of species which once filled the plenum of Nature, were all more in the true direction of the ultimate evolutionary theory than Linnaeus' theory of the origin of new species by hybridization. What irony in the fact that the tested 'new species' of Linnaeus were all demonstrably mere mutants, although in principle he was right, since new species of plants can and do arise by hybridization upon occasion!"

Thus the time has arrived when Adanson has to be accorded his true stature in the history of science, a stature that has been unfortunately obscured due to erroneous statements in the classic "History of Botany, 1530-1860" of J. von Sachs (1875; 1890).

In celebration of the Bicentenary of "Familles des Plantes" (1763), The American Plant Life Society is undertaking the sponsorship for the publication of English translations of the first parts of significant works of Michel Adanson (1727-1806) in 1963. The other parts will be published as soon as possible thereafter. During 1963, lectures on the contributions of Michel Adanson to science, and the development of the natural system of classification since Adanson will also be sponsored by The American Plant Life Society.—*Hamilton P. Traub.*

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1959 EUROPEAN TOUR REPORT

PHILIP G. CORLISS, *M. D., Somerton, Arizona*

The months of July, August, and September were spent by the writer in extensive travels in England and on the Continent, with visits to flower exhibitions and gardens from Bergen to Rome, London to Austria. The season was everywhere unusually hot and dry, with resultant rather poor quality of flowers and increase in pestilence. The prophecy of a cycle of twenty or thirty years of warmer weather all over the world, due to shrinking polar caps and other phenomena, makes it likely that this summer will be followed by even more disastrous ones, especially with regard to the increase of diseases and insects.

It seems proper to avoid specific names and places, but I feel bound to state that the presence and indeed the ravages of disease and insects was not even recognized in most regions. However, I saw rose bushes "tented" by red spiders in many famous gardens, and it was actually shocking to see the diseased condition of the foliage of many plants at the great flower exhibitions.

My own horticultural interests, although perhaps concentrated in the Amaryllis and Iris families and the genus *Hemerocallis,* do extend to other fields, and I shall touch briefly on what seemed to be the outstanding developments, if any, of what I saw.

There seem to be no world-rocking developments in the *Amaryllis* world, since my previous European reports. The lesser amaryllids are more widely known and grown in England than in the United States or on the Continent. I have not yet seen improved *Nerine* hybrids such as we have on the West Coast. The Cape Belladonna, *Brunsvigia rosea,* called "Amaryllis Belladonna" in England, are common, but seem smaller and inferior in color to ours. x *Crinodonna corsii* clone 'Fred Howard' is still a great rarity.

Interest in modern *Hemerocallis* is picking up, especially among the iris fanciers of England and on the Continent, but none of the great commercial nurseries is offering new varieties, and there are as yet no specialist nurseries to my knowledge. There is still a lag of five to ten years in the appearance of the greatly improved colors, forms, and size of *Hemerocallis,* as our members know them, in the gardens across the Atlantic.

Gladiolus have lost much favor among gardeners in the past decade or two. The emergence of a young group of English hybridizers who have organized a Syndicate may correct this trend. They made their first show appearances in England this year. One of their members won Best New Variety and another won Best Seedling in the annual exhibition of The British Gladiolus Society.

Dahlias continue to be of major importance everywhere. Wonderful new hybrids from Dutch and English breeders are legion, and they are joined by a great number from Australia and the United States. There is a tendency away from the giant types and also from the formal decoratives. This is good, as the giants are of little use save for exhibi-

tion, and the cactus type makes a more useful and pleasing home arrangement than the heavier decorative flower. Pompons are favored, and ball-type. I cannot explain the relative low favor of the collarettes, considering the strikingly beautiful new ones which are now available. There is an handful of anemone-type dahlias to be seen. They are a novelty, but otherwise of little improvement, if any, over the balls and small decoratives.

The iris breeders of England have quite caught up with the Americans. As always, the species hybrids demand more attention than they do with us. I was somewhat surprised to find a new and great interest in the Louisiana and Japanese types, heretofore much neglected in favor of Siberians and bulbous iris. I am hoping that the coming cycle of warm years will permit the English as well as the Continental gardeners to use more spurias.

I could easily write chapters on the rose. Much as we may love other flowers, it cannot reasonably be denied that the rose is the favorite flower of most people in the temperate zones. The new hybrids from breeders all over the world are crossing oceans in increasing numbers, and while you will be seeing many of the new roses bred in Denmark, France, Italy, Spain, England, Ireland, and Germany in America soon, it is nice to be able to report that many of our American introductions are in great favor in England. Two of the most popular are 'Montezuma' and 'Queen Elizabeth'. The latter is an especially good garden clone for England, achieving a vigor, height, and floriferousness in the public parks unexcelled by any clone, 'Montezuma', of course, is the best clone for cutting purposes that I have ever known.

I noted many unusual plants, but will mention only the one that impressed me the most: *Chrysanthemum parthenicum*, var. WHITE BONNET. This was exhibited by the well-known rosarian, Mr. G. S. Thomas, at the stand of his Sunningdale Nurseries at The Great Autumn Show of The Royal Horticultural Society. Lost for many years, this species was found growing in a war-damaged area recently. Its growth habits are like that of the aster species, I would say, and the lovely white flowers, just under one inch in size, are like miniature anemone chrysanthemums, with a single row of white ray petals and a pure white anemone center.

The paragraph above brings me to a closing plea for more consideration at flower shows in the United States for commercial exhibits. The principal purpose of a flower show is to stimulate and interest people in growing flowers, especially improved varieties. I have found over the past two decades that people object to reading about, or seeing pictures of, new varieties if they do not know where they can obtain them. I believe that in our flower shows we should make it possible for them to obtain these improved varieties, and that we also should be obligated to support the honest nurserymen who are endeavoring to supply them to gardeners. There are some commercial exhibits permitted in some of our flower shows, especially the great seasonal ones. I think that national shows of special plant societies, and even local shows by local gardening groups, should provide space for commercial

exhibits where catalogs may be distributed and salesmen may actively solicit or accept orders for plants, etc.

Such a program depends on a revision of present policy, especially by such influential bodies as The National Council of Federated Garden Clubs. I believe it is a sound idea. The amount of commercialism must be determined by the character, size, scope, and attendance, just as must policies of exhibits and admittance fees. Far too often, in America, commercial growers are asked to contribute flowers and equipment which may enhance the exhibition, but they are denied the right to advertise, even if they pay for the privilege, and even if their advertising exhibits may also contribute much to the show.

[**PLANT LIFE LIBRARY,** continued from page 158.]

HANDBOOK OF TOXICOLOGY. VOL. III. 1959. INSECTICIDES, A COMPENDIUM, by Wm. O. Negherbon. pp. 854. illus. VOL. V. 1959. FUNGICIDES, by E. F. Davis, B. L. Tuma, and L. C. Lee; edited by Dorothy S. Dittmer. pp. 242. illus. W. B. Saunders Co., West Washington Square, Philadelphia 5, Penna.

These volumes were prepared under the direction of the Committee on the Handbook of Biological Data, of the National Academy of Sciences and the National Research Council. Volume III deals in detail with the properties and toxicity of insecticides and such ancillary substances as acaricides (miticides), insecticide synergists, repellents, and so on. Volume V. is concerned with the properties and toxicity of fungicides. Implicit in the subjects of insecticide and fungicide toxicity is the topic of hazard to man, to domestic animals and plants, and to plants and animals in nature. These comprehensive volumes are essential to all who are interested in biology.

SYMBOLISM IN FLOWER ARRANGEMENT, by Ervin S. Ferry. Macmillan Co., 60 5th Av., New York 11, N. Y. 1958. pp. 149. illus. $4.95. The purpose of this stimulating book on the symbolism of flower arrangement is to reveal the conditions under which a plant or flower composition may evoke an idea, convey a message or arouse an emotion in the mind of the viewer, that is, the effect on the mind caused by aspect, habit of growth and arrangement of plant material in a composition. The traditions, myths and folk tales from the West and East in which certain plants have suggested emotions or moral attributes, etc., are also discussed. Highly recommended to all who are interested in flower arrangement.

SUCCESSFUL TRUCK FARMING, by G. J. Stout. Macmillan Co., 60 5th Av., New York 11, N. Y. 1958. pp. 270. illus. $6.25. In this stimulating volume, Dr. Stout explores the fundamentals of truck crop production irrespective of any particular location, giving the history of each phase of crop production, the present practices, and the future outlook. Among the topics discussed are irrigation, soils, root systems, the temperature factor, insects and diseases as ecological factors, labor, transportation, refrigeration, and marketing. This well written text should appeal to all who are interested in truck crop production.

THE ART OF FLOWER AND FOLIAGE ARRANGEMENT, by Anna H. Rutt. Macmillan Co., 60 5th Av., New York 11, N. Y. 1959. This stimulating book concerning the established principles and practice of flower arrangement has been written as a guide not only for beginners, but also to enlarge the understanding of advanced practitioners. The first three chapters are concerned with art principles and elements, and expressiveness or themes. The remaining chapters deal with Western and Eastern styles, types of arrangements, some appropriate arrangements, making of flower arrangements, and exhibiting and judging. Highly recommended to all who are interested in flower arrangement.

[**PLANT LIFE LIBRARY,** continued on page 179.]

A REVIEW OF THE GENUS **GAGEA** SALISB.

J. C. Th. Uphof, *Florida*

[Continued from page 161, **Plant Life**, Vol. 15, 1959.]

SECTION 3. **Holobolbos** Koch, in Linnaea **22:** 226. 1849. First foliage leaf free, carrying in its axil an erect bulb; the second foliage leaf usually surrounding the peduncle, without developing axillary bulbs; the third leaf protecting the young inflorescence; the fourth leaf is usually rudimentary.

40. G. lutea (L.) Ker.-Gawl. Bot. Mag. Tab. 1200; *G. fascicularis* Salisb. in Kon. et Sims, Ann. Bot. 2: 555, 1806; *G. transilvanica* Schur. in Verh. Siebenb. Naturw. Ver. 4:75, 1853; *Ornithogalum luteum* Linn. Spec. Plant, 306; *O. Persoonii* Hoppe, bot. Zeit. Regensb. 6:138, 1807; *O. majus* Gilib. Exercit. 2:467.

Description.—Stem forming at the base of bulb, resembling that of *G. pratensis*. Plants 10 to 30 cm. high. Basal leaf broad-linear, 7 to 8 mm. drawn together abruptly toward the apex, after which it becomes acute. The cauline leaves are close to the inflorescence, lanceolate, the upper ones being spider web-like ciliate along the edge. Bracts usually small, seldom having the appearance of a foliage leaf. Inflorescence and umbel, 1 to 7, occasionally 10-flowered. Segments of the perigone long, 10 to 16 mm. long, obtuse toward the apex. Pedicels relatively long, glaborous. Stamen about half the length of the flower. Var. *tenuis* Fr. Leeder is very slender, var. *Brentae* Evans has linear basal leaves, hardly half as wide as the species, var. *glauca* Blockii has bluish leaves.

Notes.—The individuals are found on grassy places, meadows, forests and vineyards, under shrubs and hedges, along streams and creeks, dune valleys from sea level to the sub alpine region, occasionally to an alt. of 1700 m. This species is distributed in most parts of Europe, is absent in Ireland, northern Scandinavia and Russia, as well as Spain, Corsica and Sardinia. It occurs also in Caucasia and Siberia.

41. G. elegans Wall. Cat. 5063.

Description.—Differs from *G. lutea* especially that the basal leaves become gradually attenuate; the lower cauline leaves are broad ovate, gradually being attenuate-acute toward the base. Inflorescence is few flowered. Segments of the perigone are oblong, acute.

Notes.—Native to Northern India and the Himalaya region.

42. G. indica Pasch. Bull. Soc. Imp. Nat. Moscou 364, 1905.

Description.—Differs from *G. elegans* mainly in that basal leaves are 1.5 to 2 cm. long, cucullate. Inflorescence is few flowered. Perigone segments are subovate-oblong, acute.

Notes.—Native to Northern India.

43. G. lowariensis Pasch. in Fedde Repert. 2: 1906.

Description.—Basal leaves broad linear, 22 mm. wide, toward the upper part cucullate, attenuate. Cauline leaves broad elliptic, clasping at the base, gradually attenuate. Flowers 16 mm. long, 3 to 4 times shorter than the pedicels. Segments of the perigone oblong, obtuse.

Notes.—Native to Northern India: Chitral relief expedition 1895, nr. 11699; Lowari Pass at 3000 to 3500 m. alt.

44. G. PUSILLA (Schmidt) Roem. et Schult. Syst. 7; 543; *G. clusiana* Roem. et Schult. Syst. 7:543; *Ornithogalum pusillum* Schmidt, Flor. Boem, Cent. 4:41; *O. tunicatum* Presl. Delic. Prag 216: *O. Clusii* Tausch. Flora 11:431, 1828.

DESCRIPTION.—Stem forming a bulb at the base. Plants 3 to 5 cm. high. Basal leaf one, narrow-linear to almost filiform, hardly 2 mm. wide, concave, narrowing toward the apex. Cauline leaves two, approaching each other, almost opposite, seldom alternate, margin glabrous; the lower leaf narrow-lanceolate, usually lower than the inflorescence; the upper leaf usually narrow-linear, mostly absent on one-flowered plants. Bracts very small or absent. Inflorescence umbellate, 1 to 3-flowered, occasionally with 6 flowers. Pedicels erect, glabrous, usually not much longer than the flowers. Segments of the perigone long-lanceolate, 10 to 13 mm. long; narrow, obtuse at the apex. Stamens two thirds the length of the flower. Capsule ovate, half the length of the flower. Var. *reflexa* Czerniajef having leaves producing bulblets in their axil, var. *obovata* Becker, segments of the perigone obovate to elongate. Leaves to 3.5 mm. wide.

NOTES.—The individuals occupy mainly sandy hills, fields, wooded and stony places. It is a pontic-illyric species, distributed in South and Eastern Europe, Caucasia, Asia Minor, Turkestan, Dsungaria and Altai. Is absent in Germany and Switzerland.

45. G. TURKESTANICA Pasch.; *G. pusilla* var. *turkestanica* Pasch. in sched.; *G. divaricata* Regel, Act. Hort. Petrop. 6: 510.

DESCRIPTION.—Differs from *G. pusilla* by its elongated stem, broader basal leaves. The cauline leaf is oblong-linear, at the base gradually attenuate. Inflorescence many flowered. Flowers are larger, 19 mm. long. Segments of the perigone are broader.

NOTES.—Native to Turkestan.

46. G. FEDTSCHENKOANA Pasch. in Fedde Repert. 1:190, 1906.

DESCRIPTION.—Plants slender, 3 to 9 cm. high. Basal leaves one, reaching the inflorescence, narrow-seldom broad-linear, at the base long attenuate, the apex being acute, flexuose, 1 to 3 mm. wide, 5 to 10 cm. long, glabrous. Flowers small, usually 6 to 9 mm. long, seldom longer, glabrous. Outer segments of the perigone oblong, obtuse, seldom more or less acute, 7-veined, 2 to 3 mm. wide, yellow; inner segments seldom narrower than the outer ones, 1.5 to 2.5 mm. wide. Filaments at the base dilatate, about one third shorter than the perigone. Ovary obovoid, obtuse, 3-sided; style double as long; stigma 3-lobed.

NOTES.—Native to the steppes and mountains of Siberia, especially Gajunktal and Karakalig Mountains. This species is related to *G. erubescens*.

47. G. ERUBESCENS (Besser) Schult. Syst. 7:545, 1829; *Ornithogalum erubescens* Besser, Enum. 45 nr. 1390, 1822; G. *reflexa* Czernajef, Consp. Plant. Charcov 64, 1859; *G. cretacea* Sukatscher in sched.

DESCRIPTION.—Bulbs brownish. Basal leaves distinctly 3-veined, undulate or revolute. Cauline leaves opposite, lanceolate-linear, at the

base more or less a sheath forming, toward the apex slightly convolute, reaching the flowers. Scape erect, slender, angulate-marginate, striate. Inflorescence umbellate, sessile. Pedicels glabrous, simple, seldom dichotome, slender, erect or nodding. Segments of the perigone lanceolate, acute at the apex, glabrous; inner ones yellow; outer ones reddish. Filaments more or less of the same length, one quarter that of the perigone. Ovary oblong, 3-sided; style short. Capsule roundish.

NOTES.—Native to Southern Russia and the Urals.

48. G. REVERCHONI Degen, Magyar Botanikai Lapuk 2:37-38, 1903.

This species is apparently related to *G. pusilla* from which it differs through the smaller perigone, the black-brown tunics of the bulbs and the nodding pedicels.

NOTES.—It approaches *G. erubescens* by these same three characteristics. Native to Spain, prefering calcarous soils, at 1400 m. alt.

49. G. LONGICAPA Grossh. in Komarov, Flora U. S. S. R. 4:735, 1935.

DESCRIPTION.—Bulbs solitary, ovate. Tunic brownish or gray-brownish. Stem 15 to 25 cm. long, slender. Basal leaf solitary, flat, 3 to 4 mm. wide, reaching above the inflorescence, apex attenuate, cucullate, sometimes glaucescent. Cauline leaves opposite, often unequal, shorter than the flower cluster, narrow linear-lanceolate, 3 to 4 mm. wide, the upper ones linear. Inflorescence 3 to 7-flowered. Pedicels unequal, thin, many times longer than the flowers, erect after anthesis. Segments of the perigone narrow lanceolate-linear, 10 to 12 mm. long, somewhat acute or obtuse, inside yellow, outside green. Anthers shorter than the segments, ovate-rotundate. Capsule obovate, half the length of the perigone.

NOTES.—In fields in Siberia. Type specimen from distr. Minussinsk. Is related to *G. erubescens* from which it differs by its shorter stem and the pedicels becoming erect after anthesis.

50. G. COREANA Nakai, in Bot. Magaz. Tokyo 36:605, 1932; *G. Nakaiana* Kitagawa in Rep. Inst. Sci. Research Manchuokua III. App. I, 136, 1939.

DESCRIPTION.—Bulbs ovoid, 10 to 17 mm. long, 7 to 12 mm. thick. Basal leaves one, 5 to 7 cm. long, 5 to 12-veined. Scape slender, 1 to 2 mm. thick. Inflorescence 1 to 6-flowered. Pedicels 15 to 30 mm. long. Segments of the perigone lanceolate or linear-lanceolate or oblong-linear, acute or acuminate, 8 to 12 mm. long, 1.5 to 2.5 mm. wide, yellowish green, with hyaline margins. Stamens 6 to 7 mm. long; anthers elliptic, yellow, 1 mm. long. Ovary ellipsoid, 2 to 3 mm. long; style slender, 3 to 4 mm. long; stigma punctate.

NOTES.—Native to Korea, mountains of Otsumitsudai, H'eijyo, prov. Keivan; and Japan, Hindo, Mountain Tsukuba, prov. Hitachi. Japanese name is Kôrai-amana.

51. G. JAPONICA Pasch. in Fedde Repert. 2:57, 1906.

DESCRIPTION.—Plants slender. Bulbs single, small. Tunics concealed, fibres absent. Basal leaves single, broad ovate toward the base ovate-oblong, attenuate. Stem erect or flexuose. Inflorescence umbellate.

Pedicels thin, 3 to 5 times longer than the flowers. Segments of the perigone obvate-oblong, 3 mm. wide and 9 mm. long. Stamen about one third of the length of the perigone. Filaments at the base dilatate. Ovary obovoid, 3-sided, scarcely with a shallow notch a rounded apex.

NOTES.—Native to Japan. The plants resemble *G. erubescens.*

52. G. PSEUDOERUBESCENS Pasch. in Fedde Repert. 2:67, 1906.

DESCRIPTION.—Lower cauline leaves ovate toward the base, 11 mm. wide and 9 cm. long. Inflorescence many flowered. Pedicels slender, 8 to 11 mm. long. Outer segments of the perigone somewhat obovate-oblong, acute; the inner ones more or less obtuse.

NOTES.—Native to Turkestan. This species resembles *G. erubescens* though the flowers are smaller.

53. G. CAPUSII Terracc. in Bull. Herb. Boiss. 5:1115, 1905.

DESCRIPTION.—Bulbs small, oblong. Basal leaves solitary, linear-lancolate, narrow, flat. Lower cauline leaves oblong-lanceolate, concave, reaching or passing the flowers, obtuse with ciliate margins. Upper cauline leaves narrow linear, ciliate, reaching below the flowers. Inflorescence few flowered, umbellate. Peduncles of unequal length, villose to pubescent. Segments of the perigone oblong-lanceolate, obtuse, distinctly veined, greenish on the outside, glabrous on the inside or partly pilose, broad white marginate. Filaments dilatate at the base, one third the length of the perigone. Anthers oblong. Ovary ovate-oblong, 3-sided; style thick, cylindric.

NOTES.—Native to Turkestan.

SECTION 4. **Tribolbos** Kock, in Syn. ed. I, 711. 1837; Boiss. Flor. Orient. **5:** 203. 1881. The first foliage leaf free, basal; margins of the second leaf more or less surrounding the peduncle as far as the inflorescence; each one carrying a bulb in its axil; the third and fourth leaves serve to protect the inflorescence; the fourth leaf is sometimes reduced.

54. G. PRATENSIS (Pers.) Roem. et Schult Syst. 7:536; *G. bracteolaris* Salisb. in Kon. et Sims Ann. Bot. 2:566, 1806; *G. stenopetala* Reichb. Flor. Germ. Exc. 107; *G. polymorpha* F. Schultz, Arch. Flor. Fr. Allem. 17; *Ornithogalum pratense* Pers. in Usteri, Ann. Bot. 11:8, 1794.

DESCRIPTION.—Two side bulbs at the base of the flowering stem develop besides the main bulb. Basal leaves one seldom two, linear, narrowed, slightly ciliate. Cauline leaves strongly drawn toward each other, ciliate; the lower leaf more or less united with the flowering stem; the upper one sometimes developing a bulb in its axil. Bracts glabrous. Infloresens umbellate, 1 to seldom 5-flowered. Pedicels long and glabrous. Segments of the perigone narrow long, 10 to 16 mm. long, somewhat obtuse. Plants grown in dry places develop larger flowers. Fruit long, becoming wider toward the upper part. Var. *simplex* Becker develops a short stem, therefore all leaves appear to be basal; var. *ciliata* Becker plants with ciliate bracts, subsp. *pomeranica* R. Ruthe develops light green plants, side bulbs often absent. Lower cauline leaves spatulate. Segments of the perigone wider, with a short obtuse apex. Fruit distinctly 3-sided. This form is sometimes considered a hybrid of *G. pratensis* x *lutea.*

NOTES.—Along fields, hills, grassy places, under hedges and vineyards, usually in flat country. It is sometimes a troublesome weed. It is distributed over a large part of Europe. Is absent in Northern Russia, Scandinavia, British Islands and a considerable part of France. It is also found in Asia Minor.

55. G. GUSSONI Terrace. Boll. Soc. Arg. 4:232, 1905; *G. stenopetala* Boiss. Flor. Orient. 5:205; *Ornithogalum pratense* Bieberst. Flor. Tauric. Caucas. 1:272.

DESCRIPTION.—Basal leaves solitary, lanceolate, subequaling the flowers, cauline leaves opposite. Scape short, slender, angulate. Inflorescence umbellate, few flowered. Peduncles short, of unequal length, glabrous. Flowers small, yellowish-green. Segments of the perigone linear-oblong, or linear-lanceolate, obtuse. Filaments subulate, toward the base dilatate; anthers more or less roundish. Ovary ovate-oblong or obovate-oblong; style short.

NOTES.—Native to Greece and Moldavia. This species resembles *G. transversalis.*

56. G. TRANSVERSALIS (Pallas) Steven, Bull. Soc. Imp. Nat. Moscou 267, 1856; *G. pratensis* forma *minor* Kunth MSS. in herb. berolinensis; *G. stenopetala* Lindem. Suppl. Bull. Soc. Imp. Nat. Moscou 100, 1875; *Ornithogalum transversale* Pallas Ind. Taur. in Nov. Act. Petrop. 10:309.

DESCRIPTION.—Bulbs small, round to ellistic. Basal leaves solitary, linear or narrow lanceolate-linear, as long as the flowers or longer. Scape short, slender, striate. Inflorescence few flowered. Pedicels short. Segments of the perigone yellow, on the outside greenish, ovate, oblong or lanceolate. Stamens one third the length of the perigone. Filaments dilatate; anthers large, round. Ovary oblong. Capsule ovate.

NOTES.—Native to Tauria and Caucasia.

SUBGENUS II. **HORNUNGIA** Pascher, in Lotos, n. ser. **14:** 110. 1904. Seeds flat, thin.

SECTION 1. **Platyspermum** Boiss., in Flor. Orient. **5:** 204. 1881. Stigma retuse or very obscurely 3-cleft.

Subsection 1. **Reticulatae** Pascher, in Lotos, n. ser. **14:** 115. 1904. Ovary prismatic, attenuate.

57. G. RETICULATA (Pall.) Salisb. Ann. Bot. 2:553, 1806; Roem. et Schult. Syst. Reg. Syst. 7:542; Boiss. Flor. Orient. 5:208; Regel. Flor. Turk. Tab. 19, fig. 1-4; Pasch. Bull. Soc. Imp. Nat. Moscou 366, 1905.

DESCRIPTION.—Tunic of various length, fibres few to numerous. Basal leaves variable as to width. Cauline leaves more or less vertical, gradually attenuate. Inflorescence umbellate. Pedicels 3 to 5 times longer than the flower. Flowers 15 to 32 mm. long. Outer segments of the perigone oblong, acuminate toward the apex; interior ones oblong, attenuate. Capsule about one third the length of the perigone. Here belong var. *circinata* (Loud.) Pasch. Bull. Soc. Imp. Nat. Moscou 364, 1905 (syn. *G. circinatum* Loud. Hort. Brit. 134; *G. reticulata* var. *tenuifolia* Boiss. Flor. Or. 10:208; *Ornithogalum circinatum* L. f., Suppl. 119; *Hornungia circinata* Bernh. Flor. 10:390, 1840), with somewhat

hairy or bristly leaves. Stem and inflorescence are often somewhat pubescent. Var. *curcticulata* Pasch. Bull. Soc. Imp. Nat. Moscou 364, 1905. Fibres around the tunic few. Leaves 2 to 4mm. wide. Var. *rigida* (Boiss.) Pasch. Bull. Soc. Imp. Nat. Moscou 364, 1905. (syn. *G. rigida* Boiss. Sprung. Diagn. Ser. I. 7,108) *G. reticulata* var. *fibrosa* Boiss. Flor. Orient. 5; 208) Plants strong, often abbreviate. Cauline leaves broad toward the base, 3 to 5 mm. wide. Flowers large, 24 to 32 mm. long. Segments of the perigone lanceolate, attenuate-acute.

NOTES.—Native to Caucasia, Armenia, Iran, Afghanistan, Beludchistan, Turkestan, Southern Siberia, Cyprus, Asia Minor and Northern India. This is a very polymorphic species.

58. G. DAYANA Chodat et Beauverd in Dinson, Plant. Port Fasc. 1:8, 1932; Dinson in Fedde Repert. 33:107-108, 1933.

This species is related to *G. alexandrinae* Boiss. (in herb.), *G. reticulata* var. *fibrosa* Boiss. and *G. damascena* Boiss. It is known from the environments of Beirut where it grows in sandy soils.

59. G. TAURICA Steven Bull. Soc. Imp. Nat. Moscou 30:2,83.

This species differs but very little from *G. reticulata*. Here belongs var. *conjungens* Pasch. in sched., having longer perigone segments. Native to Afghanistan, Iran and Tauria.

60. G. PAMIRICA Grossh. in Komarov, Flora U. S. S. R. 4:738, 1935.

DESCRIPTION.—Bulbs solitary, ovate. Tunic more or less leathery. Stem 4 to 9 cm. long. Basal leaf slightly longer than the inflorescence, narrow linear. Cauline leaves very much reduced, small, very narrow, producing bulblets in the axils. Flowers frequently solitary. Segments of the perigone 9 to 10 mm. long, lanceolate, obtuse toward the apex, yellow, on the outside green. Anthers oblong.

NOTES.—Native to the alpine regions in the Mountains of Pamiro-Alaj and Tjan-Shan, U. S. S. R. to an alt. of 4350 m.

61. G. TEHERANICA Gandoger, Bull. Soc. Bot. France 66:201, 1920.

DESCRIPTION.—Bulbs 2.5 cm. diameter. Leaves broad arcuate, deflexed. Scape short, villose. Segments of the perigone thin, dry and membraneous, 15 to 16 mm. long. Stamen two thirds the length of the perigone.

NOTES.—Has been reported from the environments of Teheran, Iran.

62. G. DIVARICATA Regel, Act. Hort. Petrop. 6, 510.

DESCRIPTION.—Bulbs solitary, ovate. Tunic reticulate, short acuminate. Basal leaves solitary, linear-filiform. Cauline leaves two or three, passing beyond the flowers. Inflorescence one to many flowered. Peduncles glabrous, divaricate. Segments of the perigone glabrous, linear-lanceolate, attenuate-acute. Anthers long.

NOTES.—This species has been considered to stand close to *G. reticulata*. The stem is more elongate and the pedicels are shorter. Native to Turkestan.

63. G. BULBIFERA (L.) Salisb. Kon. et Sims, Ann. Bot. 536, 1806; Ledeb. Flor. Rossica 4:142; Regel, Flor. Turkest. 1:111; Boiss. Flor. Orient. 5:210; *Ornithogalum bulbiferum* L. Suppl. 199.

DESCRIPTION.—Basal leaves linear. Cauline leaves passing into bracts gradually, forming bulblets in their axils. Inflorescence few

flowered. Flowers 7 to 18 mm. long. Outer segments of the perigone oblong, acute; inner ones with broad margines, obovate, oblong, acuminate or acute. Var. *nuda* Regel, Desc. Plant. Nov. 7:223 is a small slender form with smaller flowers, apparently not forming axillary bulblets.

NOTES.—Native to Turkestan, Northern Iran, Western and Southern Siberia, Northern Mongolia. The inflorescence of this species is a little more pronounced than in *G. setifolia.*

64. G. PERPUSILLA Pasch. Lotos N. F. 14.125-127, 1904.

DESCRIPTION.—Plants small, slender. Bulbs one, upright, ovoid. Tunic somewhat membranaceous, ash-colored to brown, fibres fine. Stem 2 to 6 cm. high, at the base slightly attenuate, obtuse angulose, glabrous, seldom slightly hairy. Basal leaves solitary, narrow linear, faintly attenuate at the base, slightly grooved, somewhat reddish, 3/4 to 1 1/4 mm. wide, 10 to 15 cm. long. Cauline leaves two, nearly opposite, seldom alternate; lower leaf ovate-oblong, grooved at the base; upper leaf somewhat concave to grooved at the base, slightly reddish, 3 to 4 mm. wide, 5 to 7 cm. long. Inflorescence few flowered. Pedicels of various length. Bracts narrowly linear, somewhat grooved. Pedicels and bracts slightly hairy and at some places glabrous. Flowers 8 to 9 mm. long. Outer segments of the perigone subovate-oblong or oblong, slightly acuminate, acute at the apex; interior ones oblong, attenuate at the base, subacute toward the apex. Segments greenish on the outside, yellow on the inside. Stamens one quarter the length of the perigone; filaments subulate and dilatate at the base; anthers long. Pistil slightly longer than the stamens, at the base a little attenuate, 3-sides, at the top somewhat retuse or emarginate; style double the length of the ovary; stigma slightly capitate or 3-lobed.

NOTES.—The relationship of this species within the genus is imperfectly understood. There are indications that it may belong to the section *Platyspermum* which is also the view of Boissier. Native to the Orient. Exsiccatae: Haussknecht, Iter Orientale 1068.

65. G. HISSARICA Lipsky, Act. Hort. Petrop. 23:4, 241.

DESCRIPTION.—Plants very small. Bulbs single, small. Tunic thin, dry, membranaceous. Basal leaves single, linear to narrow-linear. Cauline leaves 1 to 3, notably small, the base surrounding the stem, subequaling the flower, more or less filiform, opposite, attenuate at the base, acuminate toward the apex. Flowers single, seldom 2, small. Pedicels thin, as long or longer than the perigone. Segments of the perigone glabrous, oblong-lanceolate or linear-oblong, acute, seldom obtuse, with whitish scariose margins. Stamens one third the length of the perigone.

NOTES.—Native to Buchara, growing at an alt. of 3300 to 4000 m.

66. G. SETIFOLIA Baker, Journ. Linn. Soc. 18:101; Boiss. Flor. Orient. 5:212.

DESCRIPTION.—Bulbs small, globose. Tunic dry, surrounded by flexuose fibres. Basal leaves solitary, subulate, glabrous. Scape glabrous. Inflorescence 2 to 4-flowered, umbellate, surrounded by narrow-linear

bracts. Pedicels of various length, longer than the flower, glabrous or whitish puberulent. Segments of the perigone lanceolate, acute, yellow, greenish on the dorsal side. Stamens a little shorter than the perigone. Anthers linear-oblong.

NOTES.—Native to Afghanistan.

67. G. CHLORANTHA (Bieberst.) Schult. Syst. 7:264; Boiss. Flor. Orient. 5:209; *Ornithogalum chloranthum* Bierberst. Flor. Taur. Cauc. Suppl. 264; *G. bohemica* Regel Arct. Hort. Petrop. 3:291; Flor. Turk. 114, 115; *G. gracilis* (Welw) Reichb. Icon. Flor. Germ. Tab. 477.

DESCRIPTION.—Plants frequently short. Cauline leaves linear, long, attenuate, ciliate, alternate. Inflorescence 1 or 2-flowered. Pedicels elongate after anthesis. Flowers 12 to 16 mm. long. Outer segments of the perigone subovate oblong, obtuse; inner segments more oblong. Var. *cyprica* Pasch. in sched., is more slender, the flowers are smaller.

NOTES.—Native to Northern Iran, Cyprus and Asia Minor.

68. G. DAMASCENA Boiss. et Gaill. Diagn. Ser. 2:4, 105; Boiss. Flor. Orient. 5:209; *G. caespitosa* Hausskn. MSS.; *G. monticola* Payne. Palest. Exp. Soc. 124.

DESCRIPTION.—Plants tall to 20 cm. high. Bulbs solitary. Tunic fibrous toward the apex. Basal leaves elongate. Cauline leaves long, reaching above the flowers, narrow linear, opposite. Inflorescences 2 to 4-flowered, bracts pubescent, narrow linear. Pedicels longer than perigone. Segments of the perigone glabrous, linear-oblong, obtuse, 5 to 7-veined, marginate, on the outside greenish yellow. Filaments one third the length of the perigone. Anthers oblong. Capsule clavate-oblong, as long as the perigone.

NOTES.—Native to Central and Southern Iran, Asia Minor and Syria. In Mesopotamia it has been recorded from Mount Nimrud Dagh. By some it is considered a southern form of *G. chlorantha.*

70. G. CAUCASICA Stapf Denkschr. Akad. Wiss. Wien 15, 1885.

This species is more robust than *G. chlorantha.* Inflorescence is few flowered. Pedicels become much longer after flowering. Cauline leaves are broad, oblong-linear, somewhat vertical.

NOTES.—Native to Transcaucasia. *G. chlorantha, G. damascena* and *G. caucasica* have many forms that merge into each other.

71. G. ULIGONOSA Siehe et Pasch. Lotos N.F. 14:127-128, 1904.

DESCRIPTION.—Plants glabrous, slender, 10 to 18 cm. high. Bulbs one, erect, ovoid. Tunic dark brown, fibres few or absent. Stem terete. Basal leaves narrow linear, slightly grooved at the base, occasionally attenuate, about as long as the inflorescence, 1 to 1.5 mm. wide. Cauline leaves gradually passing into bracts, linear, scarcely attenuate, canaliculate, 4 cm. long. Inflorescence usually one flowered. Pedicels robust, sometimes slightly flexuouse. Flowers 15 to 18 mm. long. Outside segments of the perigone and pedicels reddish. Outer segments oblong, attenuate toward the apex, with narrow membranaceous margins; interior segments similar. Stamens one third the length of the perigone; filaments slightly dilatate toward the base; anthers oblong. Ovary obtuse, 3-sided, 5 to 7 times longer than wide; stigma slightly 3-lobed.

NOTES.—Native to Cilicia, was first found by Siehe in a bog meadow at 2600 m. alt. It was mentioned in 1896 by him under the above name.

Pascher was, however, unable to find a description of the species. He therefore described it for the first time in Lotos, 1904, considering himself and Siehe as the author of the name.

72. G. ALBERTII Regel Act. Hort. Petrop. 6:51[illegible]

DESCRIPTION.—Plants about 20 cm. high, caespitose. Bulbs ovate in clumps. Basal leaves about 3 mm. wide. Lower cauline leaf narrow linear, 5 mm. wide. Inflorescence densely leaved, stem short. Pedicels 1 to 1.5 times longer than the flowers, more or less robust. Flowers to 15 mm. long. Outer segments of the perigone subobovate-oblong, obtuse toward the apex; interior ones much more oblong, bright yellow. Anthers linear-oblong; stigma subcapitate or 3-lobed.

NOTES.—Native to Turkestan, at 1000 m. alt.

73. G. OLGAE Regel [illegible]

DESCRIPTION.—Plants slender, sometimes caespitose. Bulbs ovate-oblong. Cauline leaves 1 to 2, linear to filiform, 1 mm. wide. Inflorescence loose, few flowered. Pedicels 7 mm. long, double as long as the bracts. Flowers 7 mm. long. Segments of the perigone oblong, obtuse, bright yellow. Stigma distinctly 3-lobed.

NOTES.—Native to Turkestan. Plants have also been reported from Afghanistan.

74. G. VVEDENSKYI Grossh. in Komarov, Flora U. S. S. R. 4:107,737, 1935.

DESCRIPTION.—Bulbs oblong-ovate. Tunic gray, toward the apex becoming reticulate fibrous. Stem 5 to 15 cm. high, glabrous. Basal leaf narrow lanceolate, 2 to 3 mm. wide, shorter than the inflorescence. Cauline leaves narrow linear. Inflorescence 2 to 3-flowered, frequently 1-flowered. Segments of the perigone oblong-oblanceolate, 12 to 16 mm. long, toward the apex acuminate, yellow on the inside to almost white; on the outside purplish. Stamens half the length of the perigone; anthers small, oblong.

NOTES.—This species is related to *G. Olgae*. It is a native in the mountains of Pamiro-Alaj and Tjan-Schan, U. S. S. R.

75. G. AFGHANICA Terrace. Bell. Soc. Ort. Pal. 2:3,4.

DESCRIPTION.—Differs on the whole by its bright yellow perigone. Outside segments are subobovate-oblong, apex acute; interior ones obovate-oblong, obtuse or subrotundiate-obtuse, 13 mm. long; the outside is often reddish.

NOTES.—Native to Afghanistan and Southern Turkestan. Is somewhat similar to *G. stipitata*.

76. G. JAESCHKEI Pasch. Lotos N.F. 14:128-130, 1904.

DESCRIPTION.—Plants small about 15 cm. high. Bulbs solitary, erect, ovoid. Tunic ash colored, fibres absent. Stem erect or more or [illegible], often robust for a considerable part below, above somewhat smooth, seldom glabrous, 5 to 8 cm. high. Basal leaves one, more or less stout, linear at the base, slightly attenuate, at the base somewhat attenuate, acute, grooved, slightly reddish, at the base with short hairs, 10 to 13 cm. long, 1 to 2.5 mm. wide. Cauline leaves gradually resembling the bracts, internodes conspicuous; lower cauline leaf much shorter than the inflorescence, 1 to 2 mm. wide, 4 to 6 cm. long, toward

the apex attenuate, acute or obtuse; upper cauline leaf smaller, narrow linear. Bracts short, linear, 1 to 1.5 mm. wide and 1 to 1.5 cm. long, seldom ciliate. Inflorescence 1-flowered, seldom furnished by 2 flowers. Pedicels more or less hairy, seldom glabrous. Flowers 12 to 15 mm. seldom to 18 mm. long. Outer segments of the perigone oblong, attenuate, obtuse, 4 to 6-veined; outside greenish and narrowly yellowish bordered; interior ones at the base more or less pilose or glabrous, 2 mm. wide, 13 to 15 mm. long; interior segments oblong, 3-veined with a wide margin. Outside segments at the apex sometimes reddish. Stamens 3/5 to 2/3 the length of the perigone; filaments dilatate at the base; anthers oblong. Pistil longer than the stamens; ovary oblong, obtuse, 3-sided, slightly attenuate; style robust; stigma retuse more or less 3-lobed.

NOTES.—Native to Northern India, among which the Kangra Valley, Himalaya; Kailang-Lahoul, Keylang. This species was discovered by Jaeschke.

77. G. KORSHINSKYI Grossh. in Komarov, Flora U. S. S. R. 4:735, 1935.

DESCRIPTION.—Bulbs small, solitary, oblong-ovate. Tunic light colored, grayish, more or less leathery, on the outside reticulate fibres. Stem 8 to 15 cm. long. Basal leaves solitary, as long as the inflorescence, narrow-linear, about 2 mm. wide, more or less grooved. Cauline leaves solitary, narrow linear, shorter than the inflorescence. Infloresesnse 2 to 7-flowered. Pedicels erect, unequal, thin, crispulate-villose, about 2 to 3 times longer than the flowers. Segments of the perigone oblong-lanceolate, at the base attenuate, on the outside purplish.

NOTES.—Native to the mountains of prov. Darvas, Buchara. Is related to *G. kopetdagensi.*

78. G. BORNMUELLERIANA Pasch. Fedde Repert. 194, 1905.

DESCRIPTION.—Plants small, 3 to 7 cm. high, slender. Bulbs ash-gray. Basal leaves linear. Lowest cauline leaf 1 to 2 times as wide as the basal leaf. Inflorescence 1 to 3-flowered. Pedicels slender. Bracts filiform, ciliate-pilose. Flowers to 10 mm. long, glabrous. Segments of the perigone subovoid or obovate-oblong, obtuse.

NOTES.—Native to Iran. This is a very attractive species which resembles *G. damascena.* Its perigone segments are more rounded.

79. G. CHOMUTOWAE Pasch. sched. Fedde Repert. 194, 1904, bull. Soc. Imp. Nat. Moscou 372, 1905; *G. olgae* var. *chomutowae* Pasch. Fedde Repert. 2:67.

DESCRIPTION.—Plants large, 30 cm. high. Bulbs single. Tunic short. Basal leaves linear, as long as the inflorescence, 2 to 5 mm. wide, grooved. Cauline leaves half way clasping at the base of the stem, gradually attenuate; as wide as the basal leaves. Inflorescence many flowered. Peduncles very often elongate. Pedicels 2 to 5 times as long as the flowers. Flowers 18 mm. long. Outer segments of the perigone subovate-oblong; inner ones more obovate-oblong, obtuse or rotundate-obtuse. Ovary round, as long as the style.

NOTES.—Native to Turkestan. This species is closely related to

G. olgae of which it is also considered a variety.

80. G. ANISOPODA Pop. in Komarov, Flora U. S. S. R. 4:737, 1935.

DESCRIPTION.—Bulbs small, ovate. Tunic brownish, reticulate. Stems 6 to 10 cm. long, erect. Basal leaves solitary, narrow linear, about 1 to 1.5 mm. wide, above slightly grooved, glabrous, slightly longer than the inflorescence. Cauline leaves narrow linear. Flowers solitary, seldom in two's. Pedicels subflexuose. Perigone 8 to 9 mm. long, yellow, green on the outside. Segments linear-oblong, narrow, attenuate toward the apex, cuculate. Anthers oblong.

NOTES.—Native to the mountainous region of Turkomania. Type specimen from western Kopet-dagh.

81. G. IMPROVISIA Grossh. in Komarov, Flora U. S. S. R. 4:734, 1935.

DESCRIPTION.—Bulbs ovoid; bulblets numerous, black-brownish. Tunic leathery, brown or black brownish. Stem 10 to 25 cm. high, glabrous. Basal leaves longer than the stem, fistulose, 5 to 6 mm. wide. Cauline leaves 2 to 3, lanceolate-oblong; upper ones lanceolate often diminute. Inflorescence 2 to 3-flowered. Pedicels thin, somewhat nodding. Flowers 10 to 12 mm. long. Segments of the perigone oblong-elliptic, obtuse, yellow, greenish on the outside. Anthers oblong. Ovary oblong-elliptic, sessile; Style thick, short.

NOTES.—Native to Southern Transcaucasia in the Repl. Nachitschvan. Related to *G. chomutowae* from which it differs by its numerous bulblets.

82. G. CAROLI-KOCHII Grossh. in Komarov, Flora U. S. S. R. 4:736, 1935.

DESCRIPTION.—Bulbs ovate. Tunic gray with thin fibres. Scape 5 to 12 cm. long, thin. Basal leaf solitary, linear, about 2, seldom 1 to 0.5 mm. wide. Inflorescence 3 to 5, seldom 1-flowered. Pedicels pubescent, seldom glabrous. Segments of the perigone glabrous, 8 to 10 mm. long, yellow, greenish on the outside, long acuminate. Capsule obovate, half the length of the perigone.

NOTES.—Native to the mountainous regions of Southern Caucasia, Distr. Migry, Nachitschevan.

Subsection 2. **Stipitatae** Pascher, in Lotos, n. ser. **14:** 115. 1904. Bulbs often solitary; ovary stalked, obovate, becoming narrower toward the base.

83. G. PERSICA Boiss. Diagn. Ser. I. 7, 108; Flor. Orient. 5:210.

DESCRIPTION.—Bulbs small, ovate-conical. Basal leaves narrow linear, seldom wider. Lower cauline leaves broader than the basal leaves. Bracts small, producing bulblets in the axils. Inflorescence somewhat erect, few flowered, sometimes flowers are lacking. Pedicels slender. Segments of the perigone glabrous, oblong-lanceolate, obtuse. Stamens shorter than the perigone. Ovary clavate, 3-sided, attenuate toward the base. Seeds compressed. Var. *praecedens* Pasch. Bull. Soc. Imp. Nat. Moscou 373, 1905, has basal leaves that are much wider, 8 mm. broad, attenuate. Inflorescence without bulblets. Flowers are much larger.

NOTES.—Native to the mountains of Iran, Afghanistan, Southern Turkestan and Northern India to the alpine zone at 4300 m. alt.

84. G. KNEISSEA J. Thiebaut in Bull. Soc. Bot. France 8:119, 1934.

DESCRIPTION.—Plants 6 to 10 cm. high. Bulbs in two's. Tunic involute, deep brown. Basal leaves two, narrow oblanceolate, acute. Cauline leaves and bulblets absent. Inflorescence 3 to 7-flowered. Flowers small. Segments of the perigone acute or almost acute. Stamens longer than the perigone.

NOTES.—This species stands far apart from the others on account of its small flowers, though they are larger than those of *G. persica*. It is a native of Lebanon and accompanies often *G. reticulata*. It is found to an alt. of 1600 to 1900 m.

85. G. STIPITATA Merklin ex Bunge in Mem. Acad. Petersb. 7:512, 1851; *G. ova* Stapf, Botan. Ergebn. der Polakschen Exp. nach Persien 1:16, 1885; *G. persica* Kotchy in sched.; *G. persica* var. *ebulbosa* Boiss. Flor. Orient. 5:210.

DESCRIPTION.—Differs from *G. persica* through the absence of bulblets in the inflorescence. Flowers are larger, 8 to 14 mm. long. Ovary retuse, sometimes emarginate. Lower caulines leaves are larger and wider. Var. *ova* (Stapf) Pasch., Bull. Soc. Imp. Nat. Moscou 373, 1905 is more robust, its flowers are larger. It is considered as a species by Grossheim in Komarov, Flora U. S. S. R. Var. *merklini* Pasch. Bull. Soc. Imp. Nat. Moscou, 373, 1905, produces slender plants; flowers are smaller, 2 to 7 mm. long.

NOTES.—Native to Southern Turkestan, Iran, Afghanistan and Northern India.

86. G. MINUTIFLORA Regel Act. Hort. Petrop. 3:291-292, 1875.

DESCRIPTION.—Plants slender. Bulbs small, subglobose, solitary. Basal leaves solitary, filiform, shorter than the inflorescence, glabrous. Cauline leaves alternate, oblong, much smaller than the previous ones, elliptic-lanceolate, acuminate, glabrous, as long as the inflorescence or shorter. Inflorescence few to many flowered. Flowers small, 3 to 4 mm. long. Segments of the perigone oblong, obtuse, greenish-yellow, 2.5 to 3.5 mm. long; the outer ones conspicuously 3-veined; the inner ones somewhat wider. Anthers ovate, shorter than the perigone. Ovary ovate; style shorter than the stamens; stigma incarassate, truncate somewhat 3-lobed.

NOTES.—This species resembles *G. stipitata*. It is a native of the mountains of Turkestan.

87. G. TENERA Pasch. Lots N.F. 12:128, 1904; *G. amblyopetala* Vved 62, 1924; non Boiss. et Heldr.; *G. bithynica* Misaz, Flor. Caucas. Crit. 2:169, 1912.

DESCRIPTION.—Plants very small, slender, 8 to 10 cm. high. Bulb solitary, small ovoid. Tunic brown violet. Stem somewhat terete to slightly angulose, erect or somewhat flexuose. Basal leaves one, slightly grooved, narrow linear, about as long as the inflorescence. Cauline leaves small 3 to 4 mm. wide, about 5 cm. long, slightly clasping at the base, grooved, somewhat recurved at the apex. Upper cauline leaf similar though narrow and shorter attenuate. Inflorescence 1 to 2-flowered. Bracts much similar to the cauline leaves, attenuate-acute,

shorter than the pedicels. Pedicels slender, somewhat filiform, subflexuose, 1.5 to 2 times longer than the flowers. Flowers 8 to 9 mm. long. Exterior segments of the perigone yellow, oblong, subacute toward the apex; interior ones obovate-oblong, the apex being subacute to obtuse, with wide margins. Segments 1.5 to 2 mm. wide. Stamens one third of the length of the perigone; filaments dilatate, somewhat filiform. Ovary obovoid, attenuate at the base, retuse at the apex, slightly emarginate; stigma retuse, slightly 3-lobed.

NOTES.—Native to Turkestan and surrounding territory. Pascher is uncertain as to the relationship of this species. Considering the bulb, stem and segments of the perigone which are also found among the flat-seeded forms, it appears to show resemblance to *G. persica*.

SECTION 2. **Plectostigma** (Turcz.) Pascher, in Bull. Soc. Nat. Moscou **27:** 113. 1854. Pistil three-parted.

88. G. PROVISA Pasch. Fedde Repert. 1:195.

DESCRIPTION.—Plants varying from 3 to 17 cm. in height. Bulbs small. Tunic faintly developed, without fibres. Basal leaves single, narrow linear, as long or longer as the stem, 1 to 1.5 mm. wide, grooved. Inflorescence few flowered, becoming much elongated after anthesis. Pedicels erect, thin, often three times as long as the flowers. Flowers large, 12 to 17 mm. long, bright yellow; outer segments of the perigone oblong with narrow limb. Stamen one third the length of the flowers; filaments dilatate at the base; anthers elliptic. Ovary obtuse, 3-sided as long as the style.

NOTES.—This is a conspicuous species which Pascher found in the herbarium of Fedtschenko. It resembles somewhat *G. uliginosa*. Native to Eastern Siberia among which Jakutsk.

89. G. PAUCIFLORA Turcz. Bull. Soc. Nat. Moscou 28, 113; *Plecostigma pauciflorum* Turcz. l. cit.

DESCRIPTION.—Basal leaves solitary, narrow linear. Lower cauline leaves slightly wider than the basal ones, gradually changing into bracts. Inflorescence few flowered. Pedicels somewhat elongate. Flowers 12 to 18 mm. long, glabrous. Segments of the perigone oblong. Var. *Karoana* Pasch. Bull. Soc. Imp. Nat. Moscou 374, 1905, has a more dense inflorescence.

NOTES.—Native to Dahuria, Manschuria and Northern China.

90. G. LLOYDIOIDES Pasch. Lotos N. F. 14:118, 1904; *G. szechenyi* Kan. Ung. Akad. Wiss. 15:11 nomen; *Szechenya lloydioides* Kanitz, Kon. Ergebn. Reis. Szechenyi. Bot. Teil. 734.

DESCRIPTION.—Tunic wide, long. Pedicels as long as the flowers. Segments of the perigone toward the apex attenuate or acute.

NOTES.—Native to Northern China.

LITTLE KNOWN OR DOUBTFUL SPECIES

91. GAGEA ALEXEENKOANA Mischchenko, Flor. Caucas. Crit. 2:173, 1913. Caucasia.

92. G. ALTAICA Schischk. Sumner Animavers. Syst. Herb. Univ. Tomsk. Nr. 8:1, 1928. Altai Region.

93. G. CAPILLIFOLIA Vved. in Vved. et al, Key Flor. Taschk. 60, 1923, Turkestan.

94. G. CHANAE Grossh. in Grossh. et Schischk. Sched. Herb. Plant. Or. Exsicc. 16, 1924. Transcaucasia.

95. G. DUTOITTI Moire et Wilczek, Bull. Soc. Host. Nat. Agr. Nord. 23:318, 1931. Morocco.

96. G. ELLIPTICA Terracc. Boll. Soc. Arag. Spain.

97. G. GRAMINIFOLIA Vved. in Fedtsch. et al Flor. Turkm. 1:269, 1932. Turkestan.

98. G. KOPETDAGENSIS Vved. in Fedtsch et al Flor. Turkm. 1:260, 1932. Transcasp.

99. G. MAEOTICA Artentezuk nr. 23 (1) 61, 1940. Ukrainia.

100. G. POVOVII Vved. in Vved. et al, Key Flor. Taschkent. Pt. I, 62, 1923. Turkestan.

101. G. PAMPANINII Terracc. in Pamp., Pl. Trip. 53, 1914. Tripolis.

102 G. PSEUDORETICULATA Vved. in Fedtsch. et al, Flor. Turkm. 1:268, 1932. Transcasp.

103. G. SCYTHICA Artemczuk Journ. Bot. Inst. Acad. Sci. Ukraine. Nr. 23 (31): 62, 1940. Ukrainia.

104. G. TRIQUETRIA Vved. in Vved. et al, Key Flor. Taschkent. 59, 1923.

105. G. TURCOMANICA Popov in Fedtsch. et al Flor. Turkm. 1:269, 1932. Transcasp.

107 G. WILCZEKII Braun-Blanq. Mem. Soc. Sci. Maroc. No. 8, 175, 1924. Morocco.

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FORERUNNERS OF DARWIN, 1745-1859, edited by Bentley Glass, O. Temkin and W. L. Strauss, Jr. The Johns Hopkins Press, Baltimore, Md. 1959. pp. 471. illus. $6.50. This is among the outstanding books on the history of the evolutionary concept published on the occasion of the Centenary of Darwin's Origin of Species in 1859. The book includes *penetrating* essays by Arthur O. Lovejoy (6 essays), Bentley Glass (3 essays), Francis C. Haber (2 essays), and one essay each by Lester C. Crocker, Charles C. Gillespie, Jane Oppenhaimer and Owesi Remkin.

The subject matter is grouped under three headings—*The Introductory Background* is concerned with the status of geology and the biological species concept at the mid-Eighteenth century. In *The Eighteenth Century,* the contributions of Maupertuis, Buffon, Diderot, Linnaeus, Adanson, Koelreuter, Bonnet, Spallanzani, Kant and Herder toward the development of the evolutionary concept, are evaluated; the significance of fossils; and the idea of a process of time in natural history, are discussed. In *The Nineteenth Century,* the stature of Lamarck and Darwin in the history of science is considered; and the embryological enigma in the origin of species, the idea of descent in Post-Romantic German biology, the argument for organic evolution before the *Origin of Species,* 1830-1858, Schopenhauer as an evolutionist, and recent criticism of the Darwinian theory of recapitulation, are discussed. This is required reading for all biologists.—*Hamilton P. Traub.*

THE FAMILIES OF FLOWERING PLANTS, 2nd ed., by J. Hutchinson. Vol. I. Dicotyledons; Vol. II. Monocotyledons. Oxford University Press, 417 5th Ave., New York 16, N. Y. 1959. pp. 792. illus. $23.50. This revised edition of Dr. Hutchinson's important work after the passing of 33 years since the publication of the first volume of the first edition has been eagerly awaited. The principles, on which the first edition was based, have not been altered in this new edition. In the Dicotyledons, Dr. Hutchinson retains the subphylum *Lignosae* (fundamentally woody plants), and the subphylum *Herbaceae* (fundamentally herbaceous plants) with added emphasis. Such an artificial division is at variance with the facts of Nature, and is thus hardly tenable in an evolutionary system. *For instance,* the *new* family *Averrhoaceae* (low trees and arborescent shrubs), on page 350, is placed under *Rutales* among utter strangers! The *Averrhoaceae,* which are apparently closely related to the *Oxalidaceae* (herbaceous or suffrutescent=woody but very low, according to Hutchinson), on page 497, are separated by a large number of families that are unrelated to these two groups. The writer cultivated *Averrhoa carambola* L. in Florida for over a decade, and knows from actual experience that morphologically these two groups appear to be very closely related as a strict comparison of floral parts will show. This is pointed out in response to Dr. Hutchinson's invitation to anyone who would show relationship between any of the groups belonging to his contrasting subphyla. Adanson, the founder of the natural system of classification, stated the case in a nutshell *in 1752* when he explained why he placed the shipworm, *Teredo,* with the mollusks—"one must not judge by the shell, but by the nature of the animal itself." Similarly, in classifying *Averrhoa* one must *not* judge by the *low tree or arborescent shrub,* but by the nature of the plant itself as revealed particularly by its floral parts, and an ensemble of other criteria, which show undoubted resemblance to the other *Oxalidaceae.*

In contrast with the above disposition, the distribution of the *sympetalous* families amongst their apparent nearest relatives, with or without petals, is in harmony with a truly evolutionary system, and thus in the right direction.

In Volume II. Monocotyledons, with the exception of the new family *Cartonemataceae* Pinchon, and the addition of a number of new genera proposed since the first edition, few changes have been made. Dr. Hutchinson is a very modest man since he does not even mention that his great break-through—the removal of the artificial dictum of Robert Brown that the amaryllids are lilies with inferior ovaries—was confirmed in part with caryological (chromosome) data by McKelvey and Sax, Whitaker and others. This achievement of Dr. Hutchinson will stand as his lasting monument.

Among errors may be noted such misstatements as the following: under geographical distribution, *Hymenocallis* is indicated as ranging through "S. Amer." when some species reach as far north as Indiana in the United States; *Zephyranthes* through "Trop. & Subtrop. Amer.", when one species is native as far north as Virginia; *Cooperia* as "Mex. to Texas", when one species is found in Kansas; *Ungernia* (Persia), when most of the species range through Turkestan and central Asia. And so on.

Pseudostenomesson, which has large round, green, fleshy seeds is placed as a synonym of *Stenomesson,* which has flat seeds. The former is a valid genus related to *Hymenocallis. Chlidanthus,* with flat seeds, and clearly related to *Stenomesson,* is placed in the same group with *Crinum,* which has large fleshy seeds. There are numerous other similar misplacements, but those indicated will suffice to show what is needed to make such groupings more nearly phylogenetic. It is only hoped that he will cooperate with specialists and in a future edition iron out such inequalities.

However, the presence of such errors should not be interpreted as reflecting on the work as a whole which is monumental and a credit to Dr. Hutchinson. The two volumes are highly recommended to the reader.—*Hamilton P. Traub.*

DEVELOPMENTAL CYTOLOGY, edited by Dorothea Rudnick. Ronald Press Co., 15 E. 26th St., New York 10, N. Y. 1959. pp. 215. illus. $7.00.

CELL, ORGANISM AND MILLIEU, edited by Dorothea Rudnick. Ronald Press Co., 15 E. 26th St., New York 10, N. Y. 1959. pp. 326. illus. $8.00.

These outstanding volumes, edited by Dr. Rudnick, contain the papers delivered at the 16th and 17th symposiums, respectively, of the Society for the Study of Development and Growth, and include research papers by twenty-two outstanding authorities.

The first volume is concerned with the cell, both plant and animal, surveying advances in the understanding of cellular structure and function, particularly as pertaining to differentiation processes and their genetic control.

The second volume includes papers on the theme of "Differentiation and growth response to a changing chemical environment." The theme is developed with papers on the role of cell structures in cell movements, enzymatic role of topopherol in muscle tissue, regulation of the myometrium, the adaptations of alkaline and acid phosphatases in development, the chemistry and physiology of insect growth, experimental modification and development, fruit growth in relation to internal and external chemical stimuli, feedback control of growth, and physiology and biochemistry of the mammalian plastocyst.

These two volumes are indispensable to all who are interested in physiology. Highly recommended.

BLAKESLEE: THE GENUS DATURA, by Amos G. Avery, Sophie Satina and Jacob Rietsema. Ronald Press Co., 15 E. 26th St., New York 10, N. Y. 1959. pp. 289. illus. $8.75.

This outstanding book gives a complete account of the genetic investigations carried on by the late Dr. Albert Francis Blakeslee and his associates over a period of more than 40 years with several species of the genus *Datura.* This constitutes one of the most thorough and complete researches ever made of any plant group, including breeding, cytology, morphology, anatomy, physiology, embryology, geographical distribution and evolutionary history of ten *Datura* species. It represents a synthesis of a life's work. This book is required reading for all who are interested in biology.

SUBCELLULAR PARTICLES, edited by Teru Hayashi. Ronald Press Co., 15 E. 26th St., New York 10, N. Y. 1959. pp. 213. illus. $6.00. This volume includes papers by twenty authorities on cell inclusions presented at the 1958 Symposium sponsored by the Society of General Physiologists. The structural aspects of subcellular particles as related to their function are emphasized. The more definitive correlation between particles or parts thereof and their activities within the cell is made possible by improvements in techniques in ultracentrafugation, electron

[**PLANT LIFE LIBRARY,** continued on page 74.]

[**PLANT LIFE LIBRARY**, continued from page 162.]

microscopy and biochemical analysis. These basic contributions to biochemical cytology are required reading for all biologists.

THE FLOWER ARRANGEMENT CALENDAR, 1960, by Helen Van Pelt Wilson. M. Barrows & Co., 425 4th Av., New York 16, N. Y. The publishers sponsor an annual flower arrangement calendar contest. In this little book some of the outstanding photographs of floral arrangements accepted by the publishers are reproduced in calendar form for 1960. This calendar will be useful to those interested in flower arranging.

THE BOOK OF LANDSCAPE DESIGN, by H. S. Ortloff and H. B. Raymore. M. Barrows & Co., 425 4th Av., New York 16, N. Y. 1959. pp. 316. This concisely and clearly written book on landscaping design for the non-professional, by two professionals, includes the information needed by the layman—the history of the art, the theory and its applications in all its details. Highly recommended.

GRASSLANDS, edited by H. B. Sprague. Amer. Assoc. Adv. Science, 1515 Massachusetts Av., N. W., Washington 5, D. C. 1959. pp. 406. illus. $9.00. This volume makes available the papers presented by forty-four authorities at the New York A.A.A. Meeting in 1956. The papers are grouped under seven headings—Sciences in support of grasslands research, forage production in temperate humid regions, engineering aspects of grassland agriculture, forage utilization and related animal nutrition problems, evaluation of the nutritive significance of forages, grasslands climatology, ecology of grasslands, and range management. Very highly recommended.

PHOTOPERIODISM AND RELATED PHENOMENA IN PLANTS AND ANIMALS, edited by R. B. Withrow et al, Amer. Assoc. Adv. Science, 1515 Massachusetts Av., N. W., Washington 5, D. C. 1959. pp. 903. illus. $14.75. These papers, presented by seventy-five authorities at the international symposium in 1957 and sponsored by the Committee on Photobiology of the National Academy of Science—National Research Council, and with support from the National Science Foundation, are made available in this outstanding volume. The subject matter is grouped into eleven sections—photochemical principles, photocontrol of seed germination by green light, role of chemical agents in photocontrol of vegetative growth, photoperiodic control of reproduction in plants, growth factors and flowering, analysis of plant photoperiodism, relation of light to rhythmic phenomena in plants and animals, photoperiodism in the invertebrates and vertebrates, photoperiodic control of reproduction and migration in birds, and control of periodic functions in mammals by light. This is required reading for all biologists.

HAMMOND'S PICTURE LIBRARY OF PETS, PLANTS AND ANIMALS, by E. L. Jordan. C. S. Hammond & Co., Maplewood, N. J. 1958. pp. 256. illus. $7.50. The objective of this profusely illustrated book (362 original paintings in color) is to cover domesticated animals and plants that have been adapted and improved by man to serve his own purposes. The subjects included are dogs, cats, birds, fishes, reptiles, fruit and nut crops, vegetable crops, field crops, and ornamental plants.

A GEOGRAPHY OF GHANA, by E. A. Boateng. Cambridge University Press, American Branch, 32 E. 57th St., New York 22, N. Y. 1959. pp. 205. $4.00. Although this scholarly treatise of the geography of Ghana is intended primarily for students, it is apparent that it will prove useful to many others with interest in commerce and the sciences. Parts I and II, "The Land" and "Human Response" are concerned with relief and structure, climate and weather, drainage, vegetation and soils, agriculture and fishing, forest products, mining and manufacturing, population and settlements, communications and ports, trade. Part III, "Regional Pattern" is concerned with twelve detailed regional studies. Highly recommended.

SPRING FLORA OF THE DALLAS-FORT WORTH AREA, TEXAS, by Lloyd H. Shinners, Publ. by the Author, Herbarium, Southern Methodist University, Dallas 5, Texas. 1958. pp. 514 illus. This attractive book represents an abstract from Dr. Shinners' manuscript "Flora of North Central Texas". The abstract includes all flowering plants known to grow within 50 miles of Dallas and Fort

Worth, Texas, that flower between January 1 and the first week in June. Most cultivated woody plants (except coniferous evergreens) and many herbaceous plants are also included. There is a general key to the families and genera, and useful keys to species under genera where needed. Among other useful information in the Appendices, there is a most interesting account of the background of the book. We believe that Dr. Shinners is correct in making this guide to a somewhat smaller area available at this time pending the publication of his larger work. Highly recommended.

THE GARDENER'S WORLD, edited by J. W. Krutch. G. P. Putnam's Sons, 210 Madison Av., New York 16, N. Y. 1959. pp. 476. illus. This most interesting book does not give gardening instructions but "tells the story of man's love of nature and plants, of the spirit which, through the ages, has moved man to investigate and use the natural world that surrounds him," including the fashions in gardening, plant exploration, myths, fantasies and hoaxes, as told by the great writers—Addison, Johnson, Melville, Lewis Carroll, H. G. Wells, Colette, and others; and also the modern nature and gardening writers. All of this material is introduced by Mr. Krutch.

THE PLANT KINGDOM, A LABORATORY MANUAL, by P. C. Lemon and N. H. Russell. C. V. Mosby Co., 3207 Washington Blvd., St. Louis 3, Mo. 1959. pp. 176. illus. $3.25. Although this laboratory manual is correlated to be used with the text, "An Introduction to the Plant Kingdom" (1958), see Plant Life 1959, p. 168, for review, it may also be used with other recent texts which follow the evolutionary approach. The manual includes a rather comprehensive survey of the structural types and reproductive methods found in the plant kingdom.

DICTIONARY OF ECONOMIC PLANTS, by J. C. Th. Uphof. Published by H. R. Engelmann (J. Cramer), Wienheim, Germany; Hafner Publ. Co., New York. 1959. pp. 400. The objective of this comprehensive reference work, listing over 6000 different species, is to present alphabetically brief descriptions of economic plants (not including ornamental plants), with their geographical distribution, their products and principal uses. The plants included are important to agriculture, forestry, fruit and vegetable culture, and pharmacognosy, which are important in regional and international trade. However, plants that are strictly of local value are also included. This rich mine of information about economic plants will be welcomed by all who are interested in growing, marketing, and the use of plant products. Highly recommended.

THE GREEK HERBAL OF DIOSCORIDES, translated by John Goodyear, and edited by R. T. Gunther. Reprinted from the first English edition of 1933. Hafner Publishing Co., 31 E. 10th St., New York 3, N. Y. 1959. pp. 701. illus. $15.00. The famous work compiled by Dioscorides in the first century A. D. in Asia Minor was one of the sources of the herbalists for fifteen centuries, but until recently it was not available to English readers. Although John Goodyear made an English translation of this important work during 1652 to 1655, this was not published until 1933 in an edition that has long been out of print. It is this 1933 edition which has now been reprinted so that it may be generally available. The text is illustrated by a Byzantine of about A. D. 512 for presentation to Juliana Anicia, daughter of Anicius Olybrius, Emperor of the West in 472. At the end of the present edition is a catalogue of the plants in the text which have been determined with some degree of probability by Sibthorp, Lindley and others.

This is an excellent opportunity to add this valuable historical document to your library.

[**PLANT LIFE LIBRARY,** continued on page 184.]

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For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

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III. PUBLICATIONS OF THE AMERICAN PLANT LIFE SOCIETY

BOOKS

1. **AMARYLLIDACEAE: TRIBE AMARYLLEAE,** by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $5.00 postpaid.
This is required reading for every amaryllid enthusiast.

2. **DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948,** by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $2.50 postpaid.

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(A) HERBERTIA [First series, 1934 to 1948, incl.], devoted exclusively to the amaryllids (Amaryllidaceae), and the workers concerned in their advancement. A complete set of these volumes is indispensable to all who are interested in the amaryllids. Libraries should note that this may be the last opportunity for complete sets.

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[**PLANT LIFE LIBRARY,** continued from page 180.]

MELCHIOR TREUB, by H. H. Zeijlstra. Published by Koninklijk Instituut voor de Tropen, Amsterdam, Netherlands. 1959. pp. 128. illus. This biography, subtitled "Pioneer of a New Era in the History of the Malay Archipeligo", is published in English so that it will be serviceable to the many friends and admirers of Melchior Treub (1851-1910), and to all interested in research with topical plants, and agriculture. Dr. Treub was appointed Director of 's Lands Plantentuin at Buitenzorg in the Netherlands Indies in 1880 and served in the Colony until 1909. In 1903 he was instrumental in founding the Department of Agriculture in the colony and served as its first Director. The author gives a detailed report on the work carried out by Dr. Treub in basic plant research and the impact of his promotion of basic research on the development of agriculture in the colony. The volume closes with an estimate of Dr. Treub's personality. Highly recommended to all interested in plant science and tropical agriculture.—*Hamilton P. Traub.*

PLANT LIFE

VOLUME 16

[Nos. 1-4, Jan., Apr., Jul. & Oct.]

1960

EDITED BY

HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

Printed in the United States of America

Citations to this issue of PLANT LIFE should read as follows: PLANT LIFE *16:* ——— — ———, *1960.*

Address correspondence and send membership dues to:

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TABLE OF CONTENTS

Cover design by Douglas D. Craft is based on *Amaryllis blumenavia* as grown by Mr. Craft at Chicago, Illinois.

PLANT LIFE, VOLUME 16, NO. 1. 1960—HERBERTIA GENERAL AMARYLLID EDITION

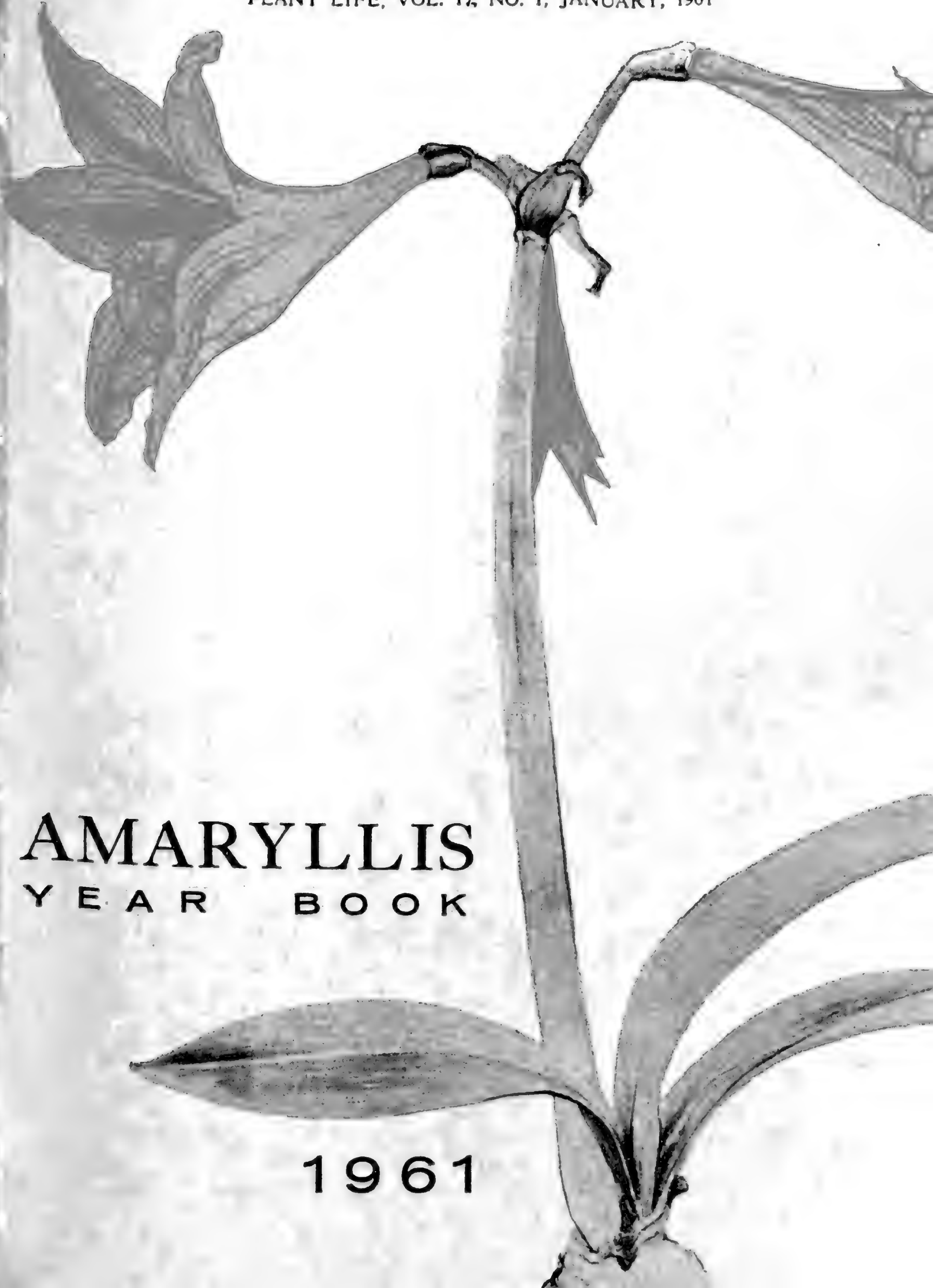
3. GENETICS AND BREEDING

4. AMARYLLID CULTURE

PLANT LIFE, VOLUME 16, NOS. 2—4, INCL. 1960
GENERAL EDITION

ILLUSTRATIONS

PLANT LIFE, VOL. 17, NO. 1, JANUARY, 1961



AMARYLLIS YEAR BOOK

1961

THE AMERICAN PLANT LIFE SOCIETY

THE AMERICAN PLANT LIFE SOCIETY is organized for the "increase and diffusion of knowledge concerning plant life," and to carry out its objectives the main emphasis is placed on the publication of PLANT LIFE, the periodical devoted to plant life, incl., HERBERTIA, the yearbook devoted exclusively to the amaryllids, sponsored by the affiliated AMERICAN AMARYLLIS SOCIETY. The publications are international in scope. All paid up members are privileged to receive the current issues of PLANT LIFE, incl., HERBERTIA.

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All persons and organizations interested in amaryllids, and other plants are invited to become members. The annual dues vary from $3.50 to $5.00 (foreign, $4.50 to $6.00) depending on the publishing costs. At present they are $3.50 (foreign $4.50) in advance which should be sent to:

DR. THOMAS W. WHITAKER, *Executive Secretary*
The American Plant Life Society
Box 150, La Jolla, California

PLANT LIFE, VOL. 17, NO. 1, January, 1961

AMARYLLIS YEAR BOOK 1961

Year Book of
The American Amaryllis Society
28th issue

GENERAL AMARYLLID EDITION

EDITED BY

HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 173.]

PREFACE

Mr. Douglas D. Craft, of the DEPARTMENT OF DESIGN, ART INSTITUTE of CHICAGO, has again favored us with a fine cover design; this time with a drawing, showing *Amaryllis reticulata* var. *striatifola*, which is based on a plant that he bloomed in his own home. These cover designs by Mr. Craft are treasured by the members.

This 28th edition of the AMARYLLIS YEAR BOOK is dedicated to Frederick B. Jones who received the 1961 HERBERT MEDAL AWARD for his contributions toward the advancement of the amaryllids. Mr. Jones is well known for his outstanding work with *Zephyranthes* and its allies. His interest, however, extends also to the other amaryllids. His name is fittingly memorialized in the beautiful yellow *Zephyranthes jonesii*. Mr. Jones contributes an interesting autobiography in the present issue. He is to be congratulated on important accomplishments.

Again, this issue contains important articles on *Amaryllis*. Mrs. St. John writes about her outstanding hybrid *Amaryllis;* Mr. Craft, about his experiences with *Amaryllis reticulata striatifolia;* Mr. Woesik about fragrance and flowering time in hybrid *Amaryllis*. Mr. Leon Boshoff-Mostert completes his interesting article on *Amaryllis* in South Africa; Mr. Buck reports on the first flowering of these in the United States; and Mr. Goedert writes about Hadeco *Amaryllis* hybrids, also from South Africa. Mr. Greenler reports on methods for inducing mutations in *Amaryllis* with X-rays; Mr. Ramelli, on hybridizing green *Amaryllis;* and Mr. Wallis, on breeding white and double *Amaryllis*. Mrs. Tebban writes on her experiences with *Amaryllis* in the Middle West; Mr. Goedert comments on the 1959-60 *Amaryllis* season; and Dr. Joseph C. Smith reports on collecting *Amaryllis* species. Amaryllis notes are contributed by Mrs. McGee, Mr. Burlingham, and Mr. Homfeld.

The other amaryllids are also adequately covered. Mr. Hunt writes on *Crinum virgineum;* and Mr. Hannibal on *Crinum* hybrids. Mrs. Anderson reports on X Crinodonnas and hybrid Brunsvigias. There are also articles on the genus X *Crinodonna* and X *Crinodonna* breeding. Miss Dormon writes about native Louisiana *Hymenocallis;* and Mr. Craft about *Eucharis fosteri*. Mr. Hunt reports on a Giant Late Hoop-Petticoat Daffodil; and Miss Dormon on *Narcissus bulbocodium*. Mrs. Menninger brings the Catalog of *Nerine* Cultivars up-to-date. Mr. Korsakoff reports on doubleness in *Habranthus;* and Mr. Hunt writes on *Rhodophiala* x *huntiana*.

Dr. Brewer contributes a most interesting article on a winter-rainfall garden in California; and Mrs. Henry reports on the naturalizing of *Agapanthus africanus* in Pennsylvania. Mrs. Schumann writes on outdoor culture of amaryllids in Michigan. Prof. Davis reports on *Cyrtanthus* and other small-flowering amaryllids for Louisiana; Mr. Hannibal writes about two *Haemanthus* species; and Mr. Hunt describes a new *Lycoris*. Dr. Brewer reports on germinating seeds in vermiculite.

Mr. Percy-Lancaster contributes another interesting Southern Rhodesia Newsletter; and Mrs. Abendroth writes about *Amaryllis* in the

Organ Mountains of Brasil. Mrs. Haydel reports on a western trip; and there are reports on the local Amaryllis Shows of 1960. There are other interesting articles.

Contributors for the 1962 issue of the AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1961, in order to insure earlier publication of that edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past several years. Your cooperation toward earlier publication will be greatly appreciated.

October 25, 1960,
5804 Camino de la Costa,
La Jolla, California.

Hamilton P. Traub
Harold N. Moldenke

CORRIGENDA

PLANT LIFE, VOL. 16. 1960

Page 37, under "Nothoscordum neriniflorum", 3rd line, for "Long." read "Lond."

Page 74, upper part of page, end of line beginning "[PLANT LIFE LIBRARY . . .", change "178" to "180".

Page 87, 16th line from top, change "(stripe)" to "(stipe)".

Page 162, last line, bottom of page, change "179" to "184".

Page 178, bottom of page, delete last line beginning "[PLANT LIFE LIBRARY . . ."

Page 179, top of page, delete first line beginning "[PLANT LIFE LIBRARY . . ."

Page 180, bottom of page, last line, change "184" to "74".

Page 184, 14th line from bottom, change "180" to "162".

See page 64 for additional Corrigenda.

Griffinia rochae Morel, **sp. nov.**

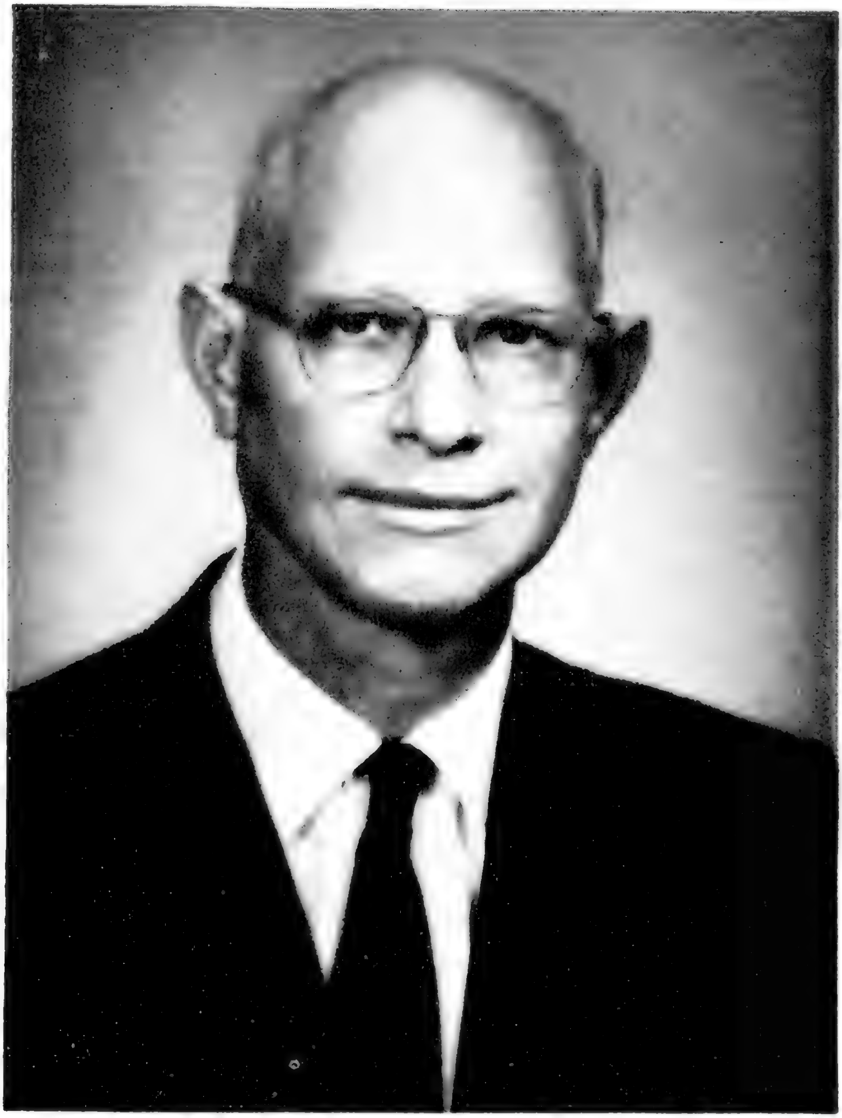
Holotype: Georges M. Morel specimen, in herbarium, Station Centrale de Physiologie Vegetale, Versailles, France.

Syn.—*Griffinia rochae* Georges M. Morel, in Baileya 8: 133, 135, fig. 55. 1960 (1961), published January 16, 1961, without indicating holotype.

According to Article 35, Int. Code, 1956 ed., "the name of a new taxon of recent plants of the rank of order or below is valid only when the nomenclatural type is indicated." Thus it is necessary to validate the name.—*Hamilton P. Traub.*

DEDICATED TO

FREDERICK BUTLER JONES



Herbert Medalist — Frederick Butler Jones, M.A.

FREDERICK BUTLER JONES, M.A.

An autobiography

I was a farm boy, the oldest of six children born to parents who came to Texas from Tennessee to try their hand at farming. Arriving in 1908, my father leased a farm near Gregory, San Patricio County, on the lower middle coast. There I was born August 31, 1909. Before long my parents bought land of their own a few miles to the west, and it was here in a newly emerging farm community that I spent most of my happy, close-to-nature childhood.

Looking over the autobiographies of other recipients of the Herbert Medal, I note that most trace their interest in plant life to early experiences and influences. Such was certainly true in my case. Our farm was surrounded on all sides by brushy pastures which stretched as far as the eye could see. The birds, mammals, insects and particularly the plants greatly intrigued me. At an early age I began collecting seeds and pressing wild-flowers.

After finishing high school in the nearby farm town of Taft, I entered Rice University and because of an adeptness at drawing, began a course in architecture. The mathematics courses proved so trying, however, that any idea of becoming an architect was forgotten, and at the end of the third year, I transferred to the University of Texas and began majoring in history. Taking an M. A. in 1935, I went on to Cornell University with the intention of making history teaching a profession. The next three and one half years were spent largely in research for my dissertation on early 18th century pacifism and internationalism. About half of this time I held an assistantship in history and by no means was unhappy with this work. Yet, increasingly I became dissatisfied with the prospect of becoming a teacher, and without writing my dissertation returned to Texas to enter farming.

Some of my happiest moments at Cornell were spent on the campus of the College of Agriculture looking over horticultural displays and experimental plots, browsing through seemingly endless shelves of books and periodicals relating to horticulture and botany. So, back in Texas, where it soon became evident that I had plenty of time for pursuits other than farming, I became absorbed in a multitude of plant projects, to such an extent, in fact, that my family and friends probably marvelled that I managed to keep my farm operation going. For several years, inspired by the early Florida horticulturists, Simpson and Nehrling, I worked on problems relating to plant adaptability to local soil and climatic conditions. In my acre-size garden plot, grew a large number of species and varieties, some brought in from distant places. Native plants fascinated me just as they did in childhood years, and the pastures were searched for kinds which seemed worthy of being brought into cultivation. Lending invaluable help was the librarian of the Massa-

chusetts Horticultural Society who freely loaned me numerous books which would not have been available otherwise. To her I am most grateful.

In 1944, I married Emma Lee Butler of Knoxville, Tennessee, acquiring not only a most gifted wife having a deep appreciation of nature, but a young step-son, Wally. Before many years had passed, we had also four endearing youngsters of our own: Carolyn, Patricia, Bruce and Phyllis.

It was my intention, during these years of intense experimentation, to make my findings available to the local gardening public in the form of a pamphlet or garden book. This idea was dropped, at least for the time being, when I learned that the accomplished garden editor of the Corpus Christi newspaper had in preparation just such a work and was assured that leading civic organizations would support its publication. I did contribute several short items to *The Corpus Christi Garden Book* (1949), a booklet of real merit which has no doubt served its purpose well, but the bulk of my research notes made in the 1940's gathers dust.

About this time, my interest turned more to bulbous plants and to botanical exploration. Returning from a visit to Tennessee in 1948, I had the good fortune to meet Mr. Mulford Foster, author of *Brazil, Orchid of the Tropics*, at his home in Orlando, Florida. Thrilled at the sight of the fine collections of plants growing in his gardens, and stimulated by his conversation, I returned to Texas intent on doing more in the way of exploration. Within a year I had discovered two *Zephyranthes* new to science, one of them, *Z. Jonesii* (Cory) Traub, growing within a mile of my farm, the other, which was actually the first one to be found, in an old yard in Laredo on the Mexican border. Aware of Wyndham Hayward's enviable knowledge of rain lilies, I wrote him about the Laredo plant. Unable to place it, he referred me to Mr. V. L. Cory, then field botanist of the herbarium at Southern Methodist University, whose observations on the Texas *Zephyranthes* had been published in *Herbertia* in 1936 and 1937. Cory considered the plant an undescribed species, but not knowing from whence it came to the Laredo yard, hesitated to publish a description of it. As a tangential result of this correspondence with Cory, Dr. S. W. Geiser, head of the Dept. of Biology at S. M. U. invited me to send any plants that I might collect in southern Texas to Dr. Lloyd Shinners, Director of the Herbarium, who would be glad to make determinations in exchange for the plants. This was the beginning of my herbarium of several thousand specimens, now housed in my garage, which includes nearly all of the native and naturalized flowering plants of the Coastal Bend area of Texas.

With the publication of *Z. Jonesii (Field & Laboratory,* XVIII, 1 (1950)), and my own note "A New Rain Lily from Texas" which appeared in the 1953 *Herbertia*, correspondence began to develop with persons far and near having interests similar to my own, these leading not infrequently to bulb exchanges and highly valued friendships. It was my privilege at this time to become personally acquainted with Dr. Thad Howard of San Antonio and with Mr. and Mrs. Morris Clint of

Brownsville, all leading students and collectors of the *Amaryllidaceae*. Mrs. Edith Strout of Kentfield, California, for many years prominent in the American Plant Life Society, asked me to join her Amaryllis Robin, and it was through membership in this group of Amaryllis enthusiasts, that I formed rewarding friendships with Mr. Armyn Spies of Belleville, Illinois, Dr. Robert Thornburgh of Palos Verdes Estates, California and Dr. Joseph Smith of La Mesa, California, all well known to readers of *Herbertia*. Besides, there were profitable exchanges of bulbs and information with Mrs. U. B. Evans of Ferriday, Louisiana and with Prof. Ira Nelson of Southwestern Louisiana Institute, both closely identified with the accomplishments of the Louisiana Society for Horticultural Research. To Dr. Walter Flory of Blandy Experimental Farm, University of Virginia, I sent living material of various amaryllids for cytological investigations.

Among bulb exchanges with persons abroad, a most fruitful one was with Prof. Caesar Vargas C. of the University of Cuzco, high in the Andes of Peru. During a field trip to the coast, he collected for me various amaryllids which I was able to try out in my Corpus Christi garden—by this time, 1954, I had moved my family to Corpus Christi where several outdoor beds had been prepared to accommodate my growing bulb collection. One of the packages from Prof. Vargas was labeled "Hippeastrum" but the bulbs in it proved to be of an exceptionally fine *Sprekelia*, a form apparently not much known in the United States, one which ought to be better known if it performs as well elsewhere as on the gulf coast.

In 1954 and again in 1955, I accompanied the Morris Clints to the Mexican plateau to hunt for rain lilies known and unknown. These trips have been reported in some detail in *Herbertia*. We did bring back, among other species and varieties, *Habranthus concolor*, a handsome yellow-flowered rain lily which unfortunately responds poorly to cultivation, at least in my garden. In looking back on these expeditions, I cannot help but marvel at the complexity of the rain lily populations in Mexico, the accurate classification of which will surely require much additional field work, as well as extensive studies of the growing plants, particularly cytological studies.

Meanwhile, in Corpus Christi, I began hybridizing in various genera, including *Zephyranthes*, of which I now had many species to work with. An interesting cross between the two familiar Texas natives, *Z. pulchella* J. G. Smith and *Z. Drummondii* D. Don, first flowered in 1956, added to the accumulating evidence that proposals made by various taxonomic workers that *Cooperia* be combined with *Zephyranthes*, should be accepted. This cross, too, at least suggested the possibility that certain of the Texas species may be of hybrid origin.

In 1958, my botanical work received a boost in the form of proposals made by Dr. Clarence Cottam, Director of the newly established Welder Wildlife Foundation of San Patricio Co., that I join Prof. Chester Rowell of Texas Technological College and Dr. Marshall Johnston of the University of Texas Plant Research Institute, in preparing

an annotated list of the native and naturalized plants of the area, a project to be sponsored by the Foundation. The work would be based to a considerable extent on my field work which was now to be intensified. Taking advantage of this chance to improve my knowledge of the local flora through use of the library and laboratory facilities of the Foundation, I was able to make a substantial contribution to *Flowering Plants and Ferns of the Texas Coastal Bend Counties* due to be published late in 1960 or early in 1961. All of the described amaryllids known to occur in the area will of course be included as well as nearly 1300 other species and varieties of wild plants, perhaps one-fourth of all the flowering plants and ferns of Texas. Many problems concerning the taxonomic status of local species remain unsolved however, and it is with some of these, particularly those relating to members of the *Amaryllidaceae*, that I hope to spend more time. In any event, I hope to continue to do what I can within the limits of my ability, to contribute to the knowledge of plant life, particularly to the botany of Texas.

THOMAS JEFFERSON AND THE AMARYLLIDS

HAMILTON P. TRAUB, *California*

The following account is based on Prof. Edwin M. Betts', "Thomas Jefferson's Garden Book, 1766—1824", published in 1944 by the American Philosophical Society. The "Garden Book" was started in 1766 before the American Revolution when Jefferson was in his 23rd year, and was continued with interruptions to 1824, two years before his death.

Since Jefferson used also memorandum books other than the "Garden Book", including the "Farm Book", "Weather Memorandum Book, 1776—1820", and wrote down important matter on odd sheets of paper, Prof. Betts has incorporated this information in the book that he has edited. In addition he has included gardening and agricultural references from Jefferson's correspondence and other sources.

Prof. Betts points out that "there still remains related material not available for publication. But not until this is released can there be a strictly definitive account of Jefferson's agricultural and horticultural pursuits." However, the main ground work has been laid down in the book edited by Prof. Betts. It is hoped that Yale University will speed up the publication of the complete works of Thomas Jefferson so that the definitive gardening book of this great American may be finally published.

In the following account, page numbers in parentheses ( ) refer to Betts', "Jefferson's Garden Book, 1766—1824" (published by the American Philosophical Society, Philadelphia, Penna., in 1944). *This is an important book that is recommended to the reader.* No attempt is made to refer to the sources that Prof. Betts uses since these are clearly indicated in the book edited by him.

Jefferson's greenhouse and flower beds.—When writing to Bernard McMahan, the Philadelphia seedsman and nurseryman, from Monticello, April 8, 1811, Jefferson explains "You enquire whether I have a hot

house, greenhouse, or to what extent I pay attention to these things. I have only a greenhouse, and have used that only for a few articles. My frequent and long absences at a distant possession render my efforts even for a few plants I aim at, abortive. During my last absence in the winter every plant I had in it perished. I have an extensive flower border, in which I am fond of placing *handsome* plants and fragrant. Those of mere curiosity I do not aim at, having too many other cares to bestow more than a moderate attention to them. In this I have placed the seeds you were so kind as to send me last. In it I have also growing the fine tulips, hyacinths & amaryllis you formerly sent me.'' (Betts, p. 455).

Jefferson's greenhouse was a glassed-in piazza on the southeastern end of his house (Betts, p. 399). Since Anne Cary Randolph at Edgehill, wrote to Jefferson on Jan. 22, 1808, that she had word that ''The green house is not done'' (Betts, p. 363), it appears that the greenhouse at Monticello was completed some time later in 1808.

Writing from Washington, Dec. 8, 1808, Jefferson explained the purpose of his greenhouse in a letter to Anne Cary (Randolph) Bankhead, ''In fact the *Mimosa nilotica* [=*Acacia farnesiana* Willd., the Sweet Acacia] & orange are the only things I ever proposed to have in my greenhouse'' (Betts, p. 381).

Jefferson's amaryllids.—The evidence in Jefferson's ''Garden Book'' shows that he and his relatives grew amaryllid species from five of the amaryllid tribes recognized today. Each of these will be briefly considered.

THE ONION TRIBE (ALLIEAE)

Jefferson paid considerable attention to the vegetable onions, *Allium cepa* L., but shallots, *Allium ascolonicum* L., chives, *Allium schoenoprasum* Metz, leek, *Allium porrum* L., and garlic, *Allium sativum* L., were also planted. The ornamental alliums are not represented.

COMMON ONION, *Allium cepa* L.

(1) Spanish onion. Among the entries for the year 1767, it is noted that ''Spanish onion'' seeds were sowed March 23 (Betts, pp. 4, 8, 47 & 58), and again on Aug. 24, 1809 (Betts, p. 389). Betts states that this may be ''any of the several varieties of the large-bulbed, mild-flavored, onions; in the United States originally applied only to imported stock but now used more broadly (Betts, p. 8). Another entry shows that ''White Spanish'' onion seeds were saved in 1794 (Betts, p. 224).

(2) Madeira onion. These were sowed on March 2, 1778 (Betts, p. 75). Betts quotes from Fearing Burr, Jr.—''The field and Garden vegetables of America'', Boston, 1863,—''This variety is much prized for its extraordinary size, and for its mild, sugary flavor . . . It requires a long warm season for its greatest perfection''. (Betts, p. 81).

(3) Hanging onion. ''Hanging onion'' was planted April 9, 1811 (Betts, p. 442). Writing from his Poplar Forest estate, Nov. 10, 1816,

Jefferson asks that "some of the small bulbs of the "hanging onion" be sent there. (Betts, p. 562). Betts (p. 448) is of the opinion that this is the same as the "tree onion", but this may not be the case since Jefferson elsewhere refers to "seed bulbs" of the tree onion (Betts, p. 389; see the tree onion below). Apparently, the "hanging onion" refers to the variety that is stored by hanging up long braids made up by intertwining the dry foliage adhering to the bulbs. Dr. Louis K. Mann, of the University of California, at Davis, Calif., (under date of August 1, 1960) writes:—"I have no recollection of ever hearing the term "hanging onion" nor has anyone else in the Vegetable Crops Department whom I have asked. The suggestion that it may be an onion whose tops are braided together and hung for storage seems reasonable."

(4) "White onion". On March 15, 1774, "white onion" was planted. These apparently trace back to stock originally brought from Italy by Philip Mazzei (Betts, pp. 47; 58), and "white onion" was sent from the City of Mexico, March 21, 1824, in care of Mr. W. McAndrews (Betts, p. 615). At this late date, it is not possible to make any further identification on these lots.

(5) Perennial tree, or winter onion (*Allium cepa* var. *viviparum* Metz).—On April 21, 1809, "tree onion . . . seed bulbs", that is bulblets, were planted (Betts, p. 389). Betts explains that "The underground bulb is small and undersized, the bulbils being borne in the flower cluster, and used for propagation" (Betts, p. 399). It should be noted that this plant is also known as "Perennial Tree or Winter Onion", (and sometimes also as "Egyptian Onion"), because it is frost hardy outdoors in the North in contrast to the frost-tender vegetable onions. The plant is classed as an early bunching onion and is eaten mainly as early green onions.

SHALLOTS, *Allium ascolonicum* L.

For 1794, the entry "shalots" appears (Betts, p. 208). Thereafter, similar entries are noted as "Scallions; shalots" for 1813 and 1814.

CHIVES, *Allium schoenoprasum* Metz.

For 1812, "Chives" are indicated (Betts, p. 473), and thereafter again for 1813 and 1814.

LEEK, *Allium porrum* L.

For 1794, "leeks" are listed (Betts, p. 208), and thereafter again for 1812; "Leeks, common, flag R.", and also, for 1813, "Leeks".

GARLIC, *Allium sativum* L.

For 1774, March 15, the entry indicates that seeds of "Garlic" of Tuscany were sown (Betts, p. 47), and thereafter "garlic" is listed in 1794, 1812 and 1813.

ZEPHYRANTHES TRIBE (ZEPHYRANTHEAE)

ATAMASCO LILY, *Zephyranthes atamasco* (L.) Herb.

On Febr. 28, 1812, Bernard McMahon, at Philadelphia, sent "some roots of *Amaryllis atamasco*" [L.] to Jefferson. (Betts, p. 481). This is now known as *Zephyranthes atamasco* (L.) Herb. It is native to southeastern U. S. as far north as Virginia.

SPREKEL'S LILY, *Sprekelia formosissima* (L.) Herb.

On April 2, 1807, Bernard McMahon wrote to Jefferson, then at Monticello, that he is sending "6 roots of Amaryllis formossissina" [L.] (Betts, p. 346). In the entry for April 18, 1807, there is a plan of the oval and round flower beds at Monticello, showing that near the house, on the "s.w.", *Amaryllis formosissina* was planted, and the accompanying list includes the entry "6 Amaryllis formosissima" (Betts, p. 346). On July 6, 1808, Jefferson wrote to Bernard McMahon from Washington, "I have tulips you sent me . . . also . . . tuberoses [*Polianthes tuberosa* L.], Amaryllis . . ." (Betts, p. 373). Again on April 8, 1811, Jefferson wrote to McMahon from Monticello, "I have also growing the fine tulips, hyacinths, ruberoses & Amaryllis you formerly sent me." (Betts, p. 455.)

Amaryllis formosissima L. is now known as *Sprekelia formosissima* (L.) Herb.

AMARYLLIS TRIBE (AMARYLLEAE)

AMARYLLIS L. (sp. unknown from West Indies, Mexico or South America).

On Nov. 9, 1807, Anne Cary Randolph writes to her grandfather, Jefferson, at Monticello, "The tuberoses & Amaryllis are taken up; we shall have plenty of them for the next year." (Betts, p. 352). Since Jefferson apparently received only 6 *Amaryllis formosissima* L. [=Sprekelia formosissima (L.) Herb.] from McMahon in April 2, 1807, these cannot be identical with the ones mentioned by Anne Cary Randolph. Apparently these *Amaryllis* were obtained long before 1807 since she has "plenty of them" which she is storing indoors over winter. Again on Dec. 12, 1808, Ellen Randolph wrote to Jefferson, "there are at least a peck of tuberoses and 12 or 14 Amaryllis roots all packed in bran . . ." (Betts, p. 381).

On May 26, 1811, Jefferson at Monticello, wrote to his granddaughter, Mrs. Anne Cary Bankhead,—"The hyacinths and tulips are off the stage, the irises are giving place to the Belladonnas, as these will to the tuberoses . . ." (Betts, p. 447).

It should be noted that Anne Cary Randolph and Ellen Randolph grew this *Amaryllis* outdoors with winter storage of bulbs, and that the method of storage indicated by the latter is that of packing in bran over winter. These could not have been the Cape Belladonna, *Brunsvigia rosea*, which make leaf growth in winter. Jefferson says that "the

irises are giving place to the belladonnas" which means that the latter, which follow the Narcissus, are early summer blooming, and thus are an *Amaryllis* L. (syn.—*Hippeastrum* Herb.). This rules out the Cape Belladonna, which is autumn flowering, and which rests in summer. The matter was checked further with Dr. W. S. Flory, Jr., of Brandy Experimental Farm, Boyce, Virginia. Under date of October 16, 1959, he writes,—"*Narcissus* bloom in the early spring, most of our *Amaryllis* L. bloom in the early summer [May and June] and then after a considerable interval the tuberoses bloom [beginning to late August]; in some years they continue to bloom right up to the time of frost."

We may never know the identity of the *Amaryllis* L. species, or possibly a hybrid, from Latin America, that is mentioned here unless further facts come to light. It could have been an *Amaryllis* species such as *A. reginae, A. vittata,* etc. or a hybrid. *Amaryllis* x *johnsonii (A. reginae* x *A. vittata)* was produced in 1799 in England, and there is a possibility that it could have found its way to America in the early 1800's, but most likely it was a species, which was grown outdoors in summer with winter storage in Virginia.

CRINUM TRIBE (CRINEAE)

CAPE BELLADONNA, *Brunsvigia rosea* (Lam.) Hann.

On August 12, 1786, while in Paris, France, Jefferson wrote to Richard Cary, stating ". . . They have disappointed me of . . . tuberoses, Hyacinths & Belladonna Lilies [=Cape Belladonna] which I had ordered." (Betts, p. 117). It was not until much later (1812) that he received bulbs of the Cape Belladonna.

On Febr. 28, 1812, Bernard McMahon, the Irish-American plantsman of Philadelphia, wrote to Jefferson, "This morning I done myself the pleasure of sending you by Mr. Gilmer a box containing the following articles." In the list is the entry "2 roots of Amaryllis belladonna [=Cape Belladonna]." (Betts, p. 481). Again, on Oct. 24, 1812, McMahon wrote to Jefferson, ". . . with this letter I expect you will receive a small box containing . . . 3 roots of Amaryllis belladonna or Belladonna Lily [=Cape Belladonna]; they belong to the greenhouse; if their strong succulent fibers or roots retain their freshness on receipt of them, do not have them cut off, but let them be planted with the bulbs in pots of good rich mellow earth, the flowers are beautiful and fragrant; their season of flowering is Sept. & Oct." (Betts, p. 491).

This is clearly the Cape Belladonna, *Brunsvigia rosea* (Lam.) Hann., under the misapplied name of "Amaryllis belladonna" which is properly applied to the scarlet-flowering plant from the West Indies and South America. But Jefferson makes no further reference to these bulbs. It is well known that they do not survive outdoors at Charlottesville, Virginia, and if they were placed in pots in the greenhouse, they might have survived, but there is no record of it. Elsewhere above it was noted that Jefferson had reserved his greenhouse for the Sweet Acacia, *Acacia farnesiana*, and the Sweet Orange. (Betts, p. 381), and that during long absences from Monticello the plants in the greenhouse perished. (Betts,

p. 455). Thus the Cape Belladonna bulbs apparently perished outdoors due to an uncongenial climate, or were lost from neglect in the greenhouse.

GALANTHUS TRIBE (GALANTHEAE)

SNOWDROPS, *Galanthus* species unknown.

Ellen W. Randolph wrote to Jefferson at Edgehill, Apr. 14, 1808, "The third of April snow drops flowered, you have none but I will give you mine if you want them, and have them set out in your garden when we go to Monticello." (Betts. p. 369).

NARCISSUS TRIBE (NARCISSEAE)

NARCISSUS (species unknown).—

On March 23, 1767, Jefferson noted that "Narcissus" bloomed. (Betts, p. 4). Again, in a flowering chart it is indicated that "Narcissus" bloomed during "March-April", 1782. (Betts, p. 94.), and on Febr. 29, 1796, it is stated that "Narcissus are up." (Betts, p. 247). In a letter from Poplar Forest estate, Nov. 10, 1816, Jefferson asks Martha (Jefferson) Randolph to send "daffodils" and "Narcissus" to his Poplar Forest estate (Betts, p. 562). Since *Narcissus* poeticus L. is late-flowering, and the blooming dates of "Narcissus" indicated by Jefferson range from March to April, which is early, it is most likely that these were Trumpet Narcissus, *N. pseudo-narcissus* L., which are early flowering.

JONQUILS, *Narcissus jonquilla* L.—

"Jonquil" is listed as blooming in April, 1782 (Betts, p. 94). This is obviously *Narcissus jonquilla* L.

It is of interest to amaryllidarians today that Thomas Jefferson, in spite of his many patriotic duties, literary and scientific projects, and farming enterprises, still had time to cherish the amaryllids available to him in the early years of our Republic.

SOUTHERN RHODESIA NEWSLETTER, 1960

SYDNEY PERCY-LANCASTER,
779 Mansfield Road, Marborough, Salisbury, Southern Rhodesia

Owing to lack of transport and the time necessary to go far into the countryside to collect plants, my son and I have only visited plots within a forty mile radius of the City of Salisbury. The City is expanding and more suburbs are springing up, in consequence land is being cleared and the indigenous flora is retreating further away. This country certainly has a number of beautiful weeds, excluding those plants that are escapes from gardens, among which can be counted *Cosmos*—yellow as well as the bipennatifida types, *Tithonia speciosa* and *Nicandra physaloides*. *Nicandra* flowers—and fruits too—when it is an inch high, in winter, but

will grow well over six feet in the wet months. This (July) is winter in Southern Rhodesia but we have a few bits of colour in *Acacia podalyriifolia*, Aloes in variety, and *Iboza*, the Ginger bush, a labiate with pale lavender coloured flowers. Bougainvilleas still give colour in most gardens but Poinsettias are just giving over. The Jacaranda, of which there are thousands in Salisbury and suburbs, have turned a beautiful golden yellow and the leaflets are falling.

On our trips into the wilds, "bundu" as the grass lands are called in the local vernacular; we have met with many beautiful weeds, some are worth introducing into the garden, for instance *Haemanthus Multiflorus*, *Buphane disticha*, *Crinum* in variety, chiefly *C. bulbispermum (capense)*, *Kniphofia*, but the yellow Aroid Lily, *Zantedeschia melanoleuca*, is rather a disappointment, the colour of the spathe is pale yellow and only one flower is produced per bulb. The terrestial orchids in variety, *Lissochilus*, are pretty but not to be compared with the orchids of the Himalayas. Local gladioli are miniatures and not interesting.

The *Clematis* that grows in the bush is only attractive when it is covered with fluffy white seed heads, but *Clematopsis stanleyi*, an erect plant with nodding white flowers, is very striking. Another common weed is called "The Bells of St. Mary", *Trichodesma physaloides*, it bears several flushes of flowers in the year and while the off-white colour of the commonest variety is not pretty, the blue shades, and a pink mutation, are worth a second glance. A lovely yellow flowered *Bauhinia*, that rambles on the hill-side, has the unfortunate trait of forming a huge tuberous root of six or more feet in length. A bush *Thunbergia*, *T. lancifolia*, bears a large number of flowers, similar to *T. erecta*; this *Thunbergia* dies down in the winter, it is very generous in the way it sets seeds. Labiates are well represented in Southern Rhodesia; *Coleus*, *Plectanthus*, *Pycnostachys* and *Iboza*, for instance, provide the lavender and blue shades of flower at different times in the year. What I consider one of the best weeds I have so far seen is *Combretum oatesii*, a dwarf shrub, seldom more than a couple of feet high. It has small bright red flowers generously produced but followed by five angled brilliant red seed pods that make the bush an outstanding feature in the grass. After all, the weeds of one country are grown by another as novelties, though exceptions must be made, I fear, when we note how unwanted *Eichhornia* (Water Hyacinth) and *Lantana* have become. They have taken too kindly to the country of their adoption!

There is an erect, three foot high, legume like a pale mauve Sweet Pea, *Dolichos lupiniflorus*, that is a perennial and worth cultivating. A brilliant scarlet *Loranthus* (?) has been met with and an orange coloured grass parasite, *Striga lutea*. Another very striking weed is *Orthosiphon shirensis* that in addition to the spike of blue-mauve flowers, not too attractive, carries a tuft of purple bracts at the end of the spike. There are two Fox-glove-like annuals that belong to the Pedaliaceae,—*Ceratotheca triloba* and *Sesamum radiatum*. We have many members of the Amarantaceae, one, spreading, with white flower heads having the centre pink; a wild white Seabious, a Sun Daisy, *Berkheya zeyheri*, yellow

flowers with narrow foliage, and many forms of Asclepias. But what is most noticeable in season are the *Gloriosa* in variety, this is the National Flower, (the Flame Lily as it is popularly called), of the Rhodesias, and my son and I have found so many variations that we are devoting a good slice of our garden for a *Gloriosa* plot. The Pineapple Lily *(Eucomis)* is a mere curiosity, *Moraea* (Irideae) are pretty and so far we have only collected one Scitamineae worth cultivating, *Cienkowskia* very close to *C. kirkii.* I hope by the time another letter is due from this part of Africa I will have more interesting news to give.

Editorial Notes.—In the case of the cultivated large-flowering *Gladiolus,* the plants have become much too large and coarse, although the colors are bright and clear. Many have abandoned these large cultivars. Mr. Percy-Lancaster states that the local Rhodesian gladioli are miniatures and not interesting. Might it not be possible to develop a new race of miniature hybrid gladioli that one could live with?

Lantana is notorious for its abuse of the hospitality extended by adopted lands. This is true in Hawaii, and elsewhere—in Southern Rhodesia also. *Lantana camara* L. (which is apparently the species that Mr. Percy-Lancaster refers to) is native to Tropical America, north to Texas and southern Georgia. In Florida, the writer noted that it was kept in check by natural enemies. Thus it might be possible to control *Lantana* in adopted lands by biological control—introducing its natural enemies. In Hawaii counter pests have been introduced for the control of *Lantana.* See page 83, Elton—Ecology of Invasions (1958), John Wiley & Sons, New York.

LETTER FROM THE ORGAN MOUNTAIN REGION, BRASIL

[The following excerpts are taken from a letter, dated Sept. 7, 1960, from Mrs. Anna Abendorth, who lives in Teresópolis, Brasil, to Dr. Joseph C. Smith, of La Mesa, Calif.]

At long last the *Amaryllis calyptrata* seeds burst their pods. I am including herewith only a few. The bulk will follow along with the bulbs I hope to send soon. That is, as soon as they stop putting out new leaves. We have had a rather rainy season . . . The bulbs simply won't rest and are not reducing weight.

In your letter of June 10 you ask if we live near from where the *Amaryllis calyptrata* grows in its wild state. By car we reach virgin forest area in about 10 minutes. A new road is being cut through that particular part of the forest. Friends have taken us several times lately . . . to go collecting plants (orchids and bromeliads chiefly). There were so many *Amaryllis* on the trees that had been cut down, it was a pity to think that they all would go to waste. I took home a few bulbs thinking of you. I shall gladly mail them if you wish, in addition to the

ones I am going to send anyhow, that is another small basket like the one I sent before, not weighing over 300 grams. I will send more if you will pay the postage, which is the only expense I have. But please, don't send money. If it is alright with you, I will rely on you to pay my Audubon Membership (U. S. $6.50) due around the first of next year. Exchange is about Cr. $180.00 to the U. S. $. You will see from the number of stamps on this letter that postage dues have increased for us, almost doubled, on account of continued decreases of the value of the xx cruzeino.

Teresópolis is an hour and forty minutes by car from Rio, just back of the Organ Mountains, 900 meters above sea level. It used to be only a very small town until recently when a direct road was built (in part cut into rock) down to the Capital. Formerly, to go to Rio, we had to go first to Petropolis, an older town also in the coastal mountain range and former summer residence of the Imperial family, and from there down to Rio. It took 3 hours. Years ago we had a direct railway to Rio. Part of it was dented. The trip also took 3 hours, at least on the time table. Actually it took 4 to 5 hours. The new road was a great improvement and has drawn a great number of visitors to our town. New restaurants and hotels were built and also apartment houses, in addition to whole new sections of summerhouses. Those who can afford it spend Sundays and vacations up here where the climate is always pleasant, away from sweltering Rio. World famous is our Organ Mountain National Park, a reservation, at least it was intended to be that. But where many people come, nature is never the same after a while.

I don't think unknown *Amaryllis* species live in the Organ Mountains.*

We are not really in the coffee area—too high. They used to plant coffee in the lower regions of the State of Rio de Janeiro in slave days. Rio coffee has a slightly bitter taste and is not much appreciated. I have seen coffee plantations in the State of S. Paulo, interior. In bloom they are wonderful, miles and miles of rolling country covered with "Christmas" trees. The perfume of the flowers is most impressive. Of course, I have a coffee tree in the garden, as a reverence to the plant that has pulled Brasil out of many difficulties. I even collect berries, hand-treat them and send the beans to our family in the Russian section of the Old Country.

I have not been to Brasilia and don't intend to go. I am sore about her on account of the drastic hardships her cost is putting on all who are not directly profiting from the enterprise. In my opinion there is no sense in putting a capital far away from anywhere in a region that isn't fit to live in on account of the strong winds and barren soil. You should

* Besides **Amaryllis calyptrata,** there are records that **Amaryllis striata, A. correiensis** (vars. **correiensis** and **compressa),** have been collected from the Organ Mountains; search should also be made for **Amaryllis reginae, A. belladonna** L., **A. reticulata,** and **A. psittacina.—Hamilton P. Traub**

[ORGAN MTS. LETTER, continued on page 35.]

1. REGIONAL ACTIVITY AND EXHIBITIONS

OFFICIAL NEW ORLEANS AMARYLLIS SHOW, 1960

MRS. A. J. HAYDEL, *Chairman*

The 12th. Official Amaryllis Show at New Orleans, with the theme "Vacation Dreams," sponsored by the Garden Circle, affiliated with the American Amaryllis Society, The Federated Council of New Orleans Garden Clubs, and The Louisiana State Federation of Garden Clubs, was held April 9-10, 1960 at Eleanor McMain School. Forty eight Garden Clubs and ten Junior Clubs participated in the arrangements. Seventeen Garden Clubs, twenty outsiders, and four schools participated in the horticulture division.

Mrs. A. J. Haydel was Show Chairman, Mrs. John Klein Jr., Vice Chairman and Mrs. W. J. Perrin, Honorary Chairman.

The arrangements were judged by six accredited judges and the horticulture entries were judged by twelve Amaryllis judges.

Mrs. Walter Duplantier of "Bud and Blossom" received the Silver Tray for the most outstanding arrangement, titled "Garden of the Gods" which was the Award of Distinction. Mrs. Vernon Grundmann of the Oak Vista Garden Club won a Silver Tray in the Tri-Color division

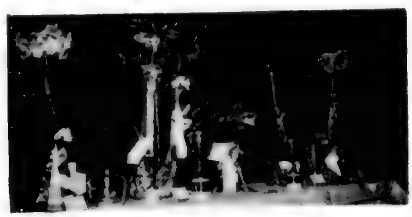


Fig. 2. Official New Orleans Amaryllis Show, 1960. *Left,* registrars at the Show; *right,* some prize-winning exhibits. Photos by Mrs. A. J. Haydel.

titled "Charm of the Orient." Miss Jerry Van Hennel of Perriwinkles Jr. Club won the Gold Cup titled "Old West Frontier Land." Mrs. Henry A. Ecuyer won the blue ribbon in the Formal Corsage division titled "Bon Voyage!", Mrs. Margaret Mistretta won the blue ribbon for the Informal Corsage titled "In Orbit!"

Mrs. James Hyde won the Ludwig's Challenge Cup for the best Ludwig specimen, 'Ludwig's Scarlet.' She, also, won The Reuters Trophy for the most outstanding specimen of the show, 'Ludwig's Scarlet.' Mrs. W. J. Perrin was runner-up with second best specimen, 'Bouquet,' Mrs. John Klein Jr. won the Klein award, a Silver Ice Bucket as Sweepstake winner of the Dutch entries in the show with seventeen blue ribbons.

The Garden Circle won the Club ribbon for the most blue ribbons in the show.

Mrs. Harry St. John won the Harry St. John Memorial Challenge Cup for the most outstanding registered American Hybrid 'Harry St. John' (St. John 1957) also the Sweepstake Gold Cup.

Master Doan Madinas won the Gold Cup in the Junior division for the most blue ribbons and Master Paul Baxter was runner-up.

"Mc Donough #7" won the trophy for the most blue ribbons in the school division.

There were six invitational arrangements displayed on pedestals, by Guest Artist, Non-Competitive, who were Mrs. C. L. Sparkman, "Egypt, Land of the Sphinx". Mrs. Charles Hardie, "Hawaiian Holiday, Beach at Waikiki"; Mrs. A. L. Herberger, "Painted Desert"; Mrs. M. A. Bradburn, "Chinatown U. S. A." Mrs. Harry W. Brown, "Cresecent City".

The following American Amaryllis Society awards were made: 'Stripped Beauty' (Warmenhoven), Award of Merit, exhibited by Mrs. John Klein Jr. 'Bouquet' (Ludwig) Award of Merit; exhibited by Mrs. W. J. Perrin. 'Harry St. John' (St. John) Award of Merit; exhibited by Mrs. Harry St. John. Most promising crossed Dutch seedling, Award of Merit; exhibited by Master Paul Baxter.

There were over 350 entries in horticulture. Over 700 attended the show including a number of visitors from out of state such as Texas, Kansas, Mississippi, Alabama, Pennsylvania, Georgia, Tennessee, and Minnesota.

Miss Lynn Latapie and Miss Shoran Jacobs were registrars.

8TH GREATER GULF AMARYLLIS SHOW, 1960

W. C. Strain, *General Show Chairman, Mobile, Alabama*

The Amaryllis Society of Mobile staged their Eighth Annual Greater Gulf Amaryllis Show April 30th and May 1st, 1960 in Mobile, Alabama. This is an Official Amaryllis Show staged under the standards of the American Amaryllis Society.

The theme of the show was "Amaryllis Circle Round" which was carried out with an eleven foot white ferris wheel with eight baskets of dozens of amaryllis as the focal point.

A total of three hundred and twenty two entries were in competition as follows: 88 potted, 151 cut, 52 arrangements, 28 art exhibits and 3 hobby exhibits. A very interesting education exhibit at which cultural information was distributed drew considerable attention.

A new division for new unnamed seedlings and clones was included in the schedule for the first time this year.

Fifteen accredited judges from Hattiesburg, Miss., Pensacola, Fla., and Biloxi, Miss., judged the show. A total of thirteen sterling silver awards were made.

Many visitors and friends from nearby towns and cities swelled the attendance to approximately 1200.

The general show chairman was W. C. Strain, who was assisted by W. R. Lowe and Harry E. McCarn as Co-Chairmen.

MEN'S AMARYLLIS CLUB OF NEW ORLEANS OFFICIAL 1960 SHOW

SANTO N. CUSHINOTTO, *Corresponding-Secretary-Treasurer*

The Third Annual Show sponsored by the Men's Amaryllis Club of New Orleans was held March 26-27, 1960 at the Wm. C. C. Claiborne School. Mr. E. Authement was the chairman of the show, with Mr. Santo N. Cuchinotto as co-chairman.

Many firsts were introduced in this show, open to all garden clubs and to the public for competition. It was the First Official All-Horticultural Amaryllis Show, actually the only all-horticultural, show in the New Orleans area. It was the first time a display of single blooms of registered amaryllis was featured. Last but not least the first time a prominent amaryllis grower was presented to the public of New Orleans, namely, Mr. Leon Boshoff-Mostert, of Balfour, South Africa.

Fig. 3. Men's Amaryllis Club of New Orleans Official 1960 Show. Mr. Santo N. Cushinotto, Co-Chairman, at the winners' table: *left to right*,—Mr. W. Perrin's American Tri-color award; Mr. A. J. Haydel's Dutch Tri-color, 'Bouquet', and Mr. W. Latapie's 'Ludwig's Scarlet', best single bloom.

The nine amaryllis judges awarded gold cups as follows; Tri-Color in Dutch Hybrid Class—Mr. A. J. Haydel; Tri-Color in American Hybrid Class—Mr. W. J. Perrin; Sweepstakes in Dutch Class—Mr. Walter Latapie; President's Trophy, for most blue ribbons won by a member of the Men's Amaryllis Club—Mr. W. J. Perrin; Best single bloom—Mr. Walter Latapie. Mr. Santo N. Cuchinotto was runner-up to Mr. Latapie and Mr. Perrin for the top awards. American Amaryllis Society Awards of Merit were presented to Mr. Latapie for 'Ludwig's

Scarlet', and Mr. A. J. Haydel for his 'Bouquet'. The usual ribbons were awarded for first, second and third place winners.

The showing of Dutch, American, and dwarf Amaryllis, both registered and unregistered, with some un-named varieties, was viewed by many guests. An educational display, along with literature, on the propagation and care of Amaryllis, was another feature of the show.

New Orleans is a city with over 100 garden clubs, many featuring one kind of flower, and the competition is great for presenting the best show. Despite adverse weather conditions, and other factors the show has been termed the best that the Men's Amaryllis Club of New Orleans has presented in its three years of existence.

THE HATTIESBURG AMARYLLIS SOCIETY

Due to the unusually cool weather from February through April, it was necessary to cancel the 1960 Show of the Hattiesburg (Miss.) Amaryllis Society. In place of the show, plans were made to show the Amaryllis blooms in nine down town stores, including also the two largest banks.

Plans are however being made to stage a regular Amaryllis Show next season. The date has been set for April 22-23, 1961.—*Mrs. Sam Forbert, Show Chairman.*

FIRST OFFICIAL SHOW OF THE HOUSTON AMARYLLIS SOCIETY 1960

MRS. A. C. PICKARD, *Show Chairman;* MRS. W. S. WHEELER, *Honorary Chairman;* MRS. FRANK S. BOVA, *Vice Chairman;* MRS. CHAS. E. PEASE, *Staging Chairman;* MRS. HENRIETTA TAYLOR*; and* MRS. R. A. FAWCETT.

There seems to be a great increase in the interest of gardeners in the Houston, Texas, area in growing the Dutch hybrid Amaryllis and species. This was reflected by the first Official Amaryllis Show held in Houston, Texas, April 26-27, 1960, under the sponsorship of the Houston Amaryllis Society, organized in 1957 by Mrs. A. C. Pickard, Judging instructor for the Amaryllis Judging certificate of the American Amaryllis Society.

The Houston Amaryllis Society is affiliated with the American Amaryllis Society, National Council of State Garden Clubs, and Texas State Garden Clubs, Coastal Prairie District IV.

All phases of the show were evidence that the monthly meetings of the Society are rapidly achieving its purpose of promotion and stimulation of knowledge about the cultivation and appreciation of *Amaryllis.*

More than 200 entries were exhibited in conformity to division standards (including sub-divisions). The color variations were classified within each division and sub-division. The cut specimens were all exhibited in uniform containers covered with green paper. The potted

specimens growing in clay pots were not covered by any detracting material.

The educational exhibit on methods of propagation of *Amaryllis* met with public approval. Many flower scapes displayed in their respective color groups, among ferns and palms with an oriental pottery figure as a central axis, gave the garden effect. A section of the show was devoted to arrangements with *Amaryllis* flowers predominating to perfection.

Several hundred visitors viewed the displays, and paused to comment on the varied Dutch named hybrids, and seedlings hybridized and propagated by members.

American Amaryllis Society awards were made—Award of Merit for "Salmon Joy" (Ludwig), the most outstanding potted horticultural specimen, was made to Mrs. W. S. Wheeler. Also the silver trophy was awarded by the Houston Amaryllis Society for the best potted specimen to Mrs. Wheeler.

Mrs. A. C. Pickard received American Amaryllis Society award for an unusual solid pink first year bloom seedling—also second highest award for "Queen of Pinks" (Van Meeuween).

Mrs. Walter Wells won high score in the Gracilis class, Mrs. Frank Bova won high score for American Belladonna type hybrid. Mrs. L. Z. Bean won a high score for named American hybrid 'Cerise Queen'.

In the guest entries, Mr. M. B. Quigles was the high in the class of Dutch seedlings. National accredited Amaryllis judges scored the exhibits.

There were many blue ribbon awards in the artistic division. Mrs. E. L. Bachelor won the tri-color in the Artistic division with an arrangement listed as "Houston in the Spring."

The display will be enlarged and repeated in 1961 with Amaryllis gardens on tour.

Interesting little booklets were given to the visitors to encourage and instruct them in the culture of *Amaryllis* to beautify their homes and gardens and to aid in the beautification of Houston.

OFFICIAL VALDOSTA (GEORGIA) AMARYLLIS SHOW, 1960

THE 2ND OFFICIAL VALDOSTA, GEORGIA, AMARYLLIS SHOW, under the sponsorship of the MEN'S GARDEN CLUB OF VALDOSTA, and THE AMERICAN AMARYLLIS SOCIETY, was held April 30 and May 1, 1960, at the Crescent.

Top awards were won by Mrs. Leonard Mederer and Mrs. J. C. Poole. Mrs. Mederer won the Tri-Color Ribbon given by THE GARDEN CLUB OF GEORGIA in cooperation with THE AMERICAN AMARYLLIS SOCIETY for her entry in the Artistic Division, and Mrs. Poole had the outstanding horticultural entry in the show that won the Award of Merit given by THE GARDEN CLUB OF GEORGIA in cooperation with THE AMERICAN AMARYLLIS SOCIETY, for the best named clone grown in a pot.

Preliminary Commendations for meritorious Hybrid Amaryllis clones were awarded to: Mr. Guy Rice, Valdosta, Ga., for the best unnamed clone grown in a pot; Mr. William J. Culpepper, Valdosta, Ga., for the best entry from the Men's Garden Club; Mrs. O. S. Ware, Valdosta, Ga., for the best entry from the hybridizer's class; and Mrs. Ritchie Rosa, Tallahassee, Fla., for the best unnamed clone grown in a pot.

Blue Ribbons were awarded in the horticultural and artistic classes to a large number of exhibitors.

CORPUS CHRISTI (TEXAS) OFFICIAL AMARYLLIS SHOW, 1960

Mrs. A. S. Meers, *Awards Chairman*

The first Corpus Christi Amaryllis Show, sponsored by the Coastal Bend Amaryllis Society, and the Corpus Christi Council of Garden Clubs, was held on March 26, 1960. The Amaryllis Show was in the nature of a section of the Lola Forrester Flower Show which is sponsored annually by the Corpus Christi Council of Garden Clubs.

There were 26 entries of potted Dutch hybrid *Amaryllis*. Five blue, three red and two yellow ribbons were awarded. One unnamed potted hybrid *Amaryllis* received no ribbon. Three named Dutch cut scapes were exhibited; one red and one yellow ribbon were awarded. One *Amaryllis* species exhibited received a red ribbon. Ten unnamed seedlings were shown, and three blue and two red ribbons were awarded. There were four Belladonna Division entries; one blue and one red ribbon were given. Among 18 of Reginae Division entries, three blue and one red ribbon were awarded. There were a total of 63 entries.

The following American Amaryllis Society awards were made:

Award of Merit to Mrs. H. L. Harris, Corpus Christi, Texas, for the exhibit of hybrid Amaryllis clone 'Apple Blossom'.

Preliminary Commendation (P. C.) to Mrs. H. L. Harris, Corpus Christi, Texas, for an outstanding unnamed seedling #55.

The judges were: Mrs. A. C. Pickard, Houston, Texas; Mrs. L. B. Peckenpaugh, Corpus Christi, Texas and Mrs. Harvey J. Fry, Jr., Corpus Christi, Texas.

THE 'HARRY ST. JOHN' HYBRID AMARYLLIS

Mrs. Harry St. John, *New Orleans, Louisiana*

I would like to tell you about my lovely Amaryllis hybrid and point out its many fine qualities.

In 1955, I attended my first Official Amaryllis Show which was sponsored by the Garden Circle. I brought a scape of four blooms to ask if anyone knew the name of it. After speaking with the late Mrs. La Forest Morton at length, who admired the bloom very much, she said that she had never seen one like it, and asked if the Amaryllis Queen of 1955 could use the scape for the crowning ceremony. This thrilled me very much. Later, I asked Mrs. Morton if she would try to find out something about the hybrid. I had grown it for over 30 years as a

garden plant—potted for the Show exhibits. Evidently it could not be assigned to any named clone, and thus it was open to be named. In the Amaryllis Year Book (Herbertia) of 1958, page 54, it was named in honor of my husband.

In 1956, I entered my first Amaryllis exhibit in the Official Amaryllis Show staged by the Garden Circle, and was very proud when I won top honors. Would like to mention that I sent a bulb and a scape

Fig. 4. Awards received by Mrs. St. John for the Hybrid Amaryllis clone 'Harry St. John'. See text for details about ribbon and tricolor awards.

Top row, left, La Forest Morton Cup, 1959.

Top row, right, Garden Circle Amaryllis Show; 11th Official American Sweepstakes Cup, 1960.

Top row, center, 1959 for blue ribbon, small cup.

Bottom row, left, Harry St. John Trophy Cup, 1959; won again 1960.

Bottom row, right, Newsham-Becnel Cup, 1959.

of the clone 'Harry St. John' to our First Lady, Mrs. Mamie Dowd Eisenhower. The scape had won First Prize. I received a lovely Thank You note by return mail saying that she was going to plant the bulb on their Gettysburg Lawn, and would be looking forward to seeing it bloom the next year.

The record of the clone 'Harry St. John' has been written up in Maud O'Brien's column of our City newspaper. Our Garden Circle has used a bloom of the clone 'Harry St. John' since 1955 for the crowning ceremony of the Amaryllis Queen

I feel proud to report that the clone 'Harry St. John' has won twenty blue ribbons, five Awards of Merit, three Sweep Stakes, two Tri-Color awards, and five Gold Cups, including the Newsham-Becnel Nursery award at the Men's Official Amaryllis Show of 1959. The Harry St. John Memorial Challenge Trophy which I had given to the Garden Circle Club, which, if won three times over a period, or two successive years, which I did, and am proud. See Fig. 4, for ribbons and cups won by the clone 'Harry St. John'. I wish to report that I will again give another Trophy for the 1961 Show.
Amaryllis Year Book Herbertia) of 1958, page 54, it was named in

The clone 'Harry St. John' (St. John, 1958), is a Leopoldii 5-B, length 5½″ in diameter, and 8—9″ across the face, rose red with deep red velvet throat, tepalsegs pointed and reflexed, overlapping past the middle of the flower; plant 22—26″ in height. The stamens are rose red. The flower is delightfully fragrant; foliage evergreen. It will bloom in February if the winter is not too severe, or in March. It produces offsets freely. It usually has four, sometimes six flowers, very rarely only two. It always produces two scapes almost simultaneously from a single bulb, and often blooms a second time later in the year. When the bloom begins to wane, a sweet-scented honey drips from the blooms. Having all this beauty, it still requires so little care for it thrives in the garden. I grow it among the other flowers; it does not like a soil that is too rich. It grows best when planted deeply in a mixture of river sand and ordinary garden soil. On the south side of the house, the scapes are shorter and the blooms are lighter. On the north side, the blooms are much deeper colored, and the scapes are up to 28″ tall, and bloom two to three weeks later.

Would like to report that our past President, Mrs. A. J. Haydel, who works very hard for our Club, made a trip in company with her husband to California. They visited with Dr. Traub, and also delivered a bulb of 'Harry St. John' to him, so that he can grow it in his trial garden. I hope that he enjoys the blooms as much as I do.

It has been awfully nice visiting with you through the Amaryllis Year Book (Herbertia), and I hope to be asked to visit again.

OUR WESTERN TRIP IN 1960

Mrs. A. J. Haydel, *Louisiana*

I had wanted to make a western trip for some time, and fortunately in the spring of 1960, my husband and I motored to the Pacific Coast, with the intention of stopping off at La Jolla, California, for a visit with Dr. Hamilton P. Traub.

Amaryllis growing is my favorite hobby, and in this connection I am a member of the Garden Circle of New Orleans, which stages the annual Official Amaryllis Show of New Orleans. I am a member of the American Plant Life Society and the affiliated American Amaryllis Society, under whose auspices the annual Show in New Orleans is held. I also belong to several other active clubs.

Our first stop was in Corpus Christi, Texas, where we visited Mr. Fred B. Jones and Mr. & Mrs. H. John Harris. The Amaryllis blooming season was past, but we saw the Amaryllis collections. Mr. Jones has a number of Amaryllis species, but at the present time there was not sufficient increase for distribution.

We next visited with Mrs. Morris Clint, of Brownsville, Texas, who has a most interesting trial garden which contains amaryllids and other plants which she has collected in Texas and Mexico, and plants sent in from other parts of the world. She has a number of *Amaryllis* species but the increase has not been sufficient to warrant distribution up to the present. I plan to make a collection of species *Amaryllis* so that one day these may be displayed at the annual Amaryllis Show in New Orleans. However, up to the present, it is difficult to obtain the species. Any help from *Amaryllis* enthusiasts will be greatly appreciated.

During the drive westward through Texas, New Mexico and Arizona the brilliant cactus blooms were much admired; these are quite different from the cacti that we have at home.

On June 10, we arrived at La Jolla, California, and the most interesting visit with Dr. Traub. As we drove up to his place, we noted the beautiful two-story stucco home, and the amaryllids and daylilies.

I had the opportunity of discussing the staging of the Amaryllis Show, and the judging of *Amaryllis* clones with Dr. Traub. The first rules had been adopted in 1934 by the American Amaryllis Society, and these have been improved through the years. Before the last war, these rules had upheld a very high standard for Amaryllis exhibits, but after the war, the many Amaryllis breeders who had taken up war work did not return to Amaryllis breeding, and the high judging standards were no longer used. At this stage the Amaryllis work was taken up by entirely new groups, and in order to attract sufficiently large exhibits, the standards were lowered somewhat temporarily to allow the blue ribbon for scapes with only two florets to the scape as a minimum. By 1960, the new groups had progressed to the stage where the resumption of the high pre-war standards could again be considered, which allow a minimum of three florets per scape for the blue ribbon.

When the new groups took up the work after the war, the hybrid Amaryllis clones produced since the 1930's had not been registered. There were no exact descriptions on record and names could be duplicated. To remedy these deficiencies, our own late Mrs. W. D. Morton, of the New Orleans Garden Circle, began the registration of hybrid Amaryllis clones as the official registrar of the American Amaryllis Society, succeeding the late Prof. W. R. Ballard. She was assisted by her husband, Mr. W. D. Morton, Jr., who has since carried on as the official registrar. Once the great majority of the Amaryllis clones had been registered, the time had again arrived when only registered *named* clones may receive the full American Amaryllis Society awards. *Un-named* seedlings and *un-named* clones may receive Preliminary Commendations before registration.

I asked about the point system with reference to *fragrance* which is not found in most presently registered hybrid Amaryllis. In the past

many more clones had fragrance, but due to the lack of an incentive, the breeders had paid little or no attention to this character after the war. Since the perfect Amaryllis must also have fragrance, the minimum of 2 points was established for this character. Thus, the breeders are again keeping fragrance in mind in selecting new hybrid Amaryllis clones.

I also asked about a *separate class* for exhibits for potted plants, having scapes with *only two florets*, when exhibited in *groups of three* potted plants. In such groups all could be of one kind, or two, or three different kinds. Exhibits in this special class are for show only, and are not to be judged for any regular awards, but could receive special awards which do not count toward sweepstakes and tricolor awards.

The matter of cut florets, singly or two, exhibited in small glasses, was also mentioned by Dr. Traub. These were not recognized under the pre-war rules, and such exhibits are not to receive the regular ribbon or other awards and may be used in decoration only. However, single, two, or several florets may be used with other materials under flower arrangements.

After finishing the discussion on Amaryllis shows, Dr. Traub took us on a guided tour through his garden. The many Amaryllis species had finished blooming except the tiny *Amaryllis blumenavia*. The highlight in his garden in June was the tetraploid daylilies of which he had hundreds in bloom. The tetraploids are named *Hemerocallis washingtonia* and were produced during the past decade by doubling the chromosomes of the diploids, and then intercrossing the tetraploids. The named clones are worth $100 or more per plant; he has donated the whole collection to the American Plant Life Society for its endowment fund.

While we were on the subject of Amaryllis breeding, I told him about the double hybrid Amaryllis that was obtained by selfing. He was much interested in this work and requested that I write something for publication in the Amaryllis Year Book. However, I did not have any photograph of the doubles, but hope to take some next spring for reproduction in the 1962 issue together with an account of the selfing with results.

Although I took some movies of Dr. Traub's place and flowers, I do not have any that could be developed for the 1961 Amaryllis Year Book.

One thing more about Dr. Traub—he seems to have so much energy and never tires of his work. He tries to be helpful in the case of unidentified Amaryllis species.

After leaving La Jolla, we journeyed north as far as San Francisco. I collected a few liliaceous wild flowers in the mountains.

On the way back, we stopped in Houston to visit with Mrs. A. C. Pickard. She does a lot of Amaryllis hybridizing; she is an Official Amaryllis Judge, and is also an Official Instructor for the Official Amaryllis Judge's Certificate. The landscaping of her garden is attractive. Her Amaryllis are arranged by colors and in between she has many different flowering plants that harmonize with the colors of the Amaryllis. She also has a large collection of begonias and ferns.

On the return from the three weeks of motoring through the west, I felt well repaid with the new knowledge acquired by exchanging ideas with Amaryllis growers in other parts of our great Country.

EDITOR'S MAIL BAG

Your Editor had a most pleasant visit with Mr. and Mrs. Leon Boshoff-Mostert, of Balfour, Transvaal, Union of South Africa, April 18—22, 1960. His interest is primarily in the breeding of superior *Amaryllis* hybrids, and her interest is with irises, and daylilies. While in San Diego, Mr. Mostert gave his lecture on Hybrid *Amaryllis*, including a large number of colored slides of his own hybrids. The Mosterts boarded ship for home after touring the United States from coast to coast.

Your Editor enjoyed the most pleasant visit with Mr. and Mrs. A. J. Haydel, of New Orleans, Louisiana, on June 10, 1960, although it was much too short. There were so many *Amaryllis* matters to talk over that the time was hardly sufficient. The Haydels stopped off for the visit while on a tour of the southwest.

On June 10, 1960, Mr. William P. Carpenter, 333 Grove Way, Delray Beach, Florida, who is a research specialist with Floral Acres, Inc., Wholesale Florists, of Delray Beach, Fla., visited with your Editor. Mr. Carpenter is interested in working out the details for the marketing of *Amaryllis* as pot plants. He is also interested in other subjects such as Delphiniums, stocks, etc.

When Mr. & Mrs. Menninger, of Arcadia, Calif., visited Europe for the INTERNATIONAL ORCHID SHOW in the summer of 1960, they visited the nursery of "Mr. Simon de Goedo in Elst, near Arnhem, Netherlands, who has about one quarter million nerines. Of course, they were dormant, but very well-grown large bulbs."

T. J. Sheehan and K. J. Howe, Assistant Ornamental Horticulturist and interim Assistant Professor of Botany, respectively, UNIVERSITY OF FLORIDA, at Gainesville, Fla., presented a paper on "A study of some factors affecting *Amaryllis* flowering" at the meeting of the FLORIDA STATE HORTICULTURAL SOCIETY, at Miami Beach, Fla., Oct. 29-31, 1957. The paper is published in the Proceedings of the Florida State Hort. Soc. Vol. LXX: 387-389. 1957.

Mr. R. D. Wescott, General Manager, Paul J. Howard's California Flowerland, 11700 National Boulevard, Los Angeles 64, Calif., writes under date of Sept. 12, 1960, that "the firm of Howard & Smith will no longer continue in the nursery business; Mr. Arthur P. Howard, brother of Fred Howard, will possibly continue some *Amaryllis* breeding.

"Our firm, long associated but not directly connected with Howard and Smith, has acquired much of the breeding stock of the H. & S. *Amaryllis*, and will be in production in the near future. This will be under the guidance of Paul J. Howard, another brother. The date of Mr. Fred H. Howard's death was July 15, 1948."

We have learned from a correspondent that a salmon-pink variety of *Vallota speciosa* is cultivated in Cape Province, South Africa. This is apparently var. *delicata* which is reported to have salmon-pink flowers. This should be a welcome addition to the scarlet of the type; and the varieties *alba; elata*, cherry red; and *eximia*; throat white, rest with crimson penciling.

The Ornamental Horticulture Center, of the UNIVERSITY OF SOUTHWESTERN LOUISIANA, COLLEGE OF AGRICULTURE, at Lafayette, Louisiana, was officially opened on November 1, 1960. The welcoming address was given by Dr. Joel L. Fletcher, President of the University; and addresses were delivered by Dr. F. P. Cullinan, of the U. S. DEPT. OF AGRIC., and the Hon. Bona Arsenault, Minister of Lands and Forests, Quebec, Canada.

Your Editor enjoyed a visit from Dr. & Mrs. Robert F. Hoover, of San Luis Obispo, Calif., on Oct. 16, 1960. Dr. Hoover is the world authority on the BRODIAEA LILIES, which include among others, *Tripeleiopsis, Triteleia, Dichelostemma*, and *Brodiaea*, which have been monographed by him. Dr. Hoover received the 1955 Herbert Medal for his outstanding work on these genera (see PLANT LIFE, 1955).

It saddens us to report the death of Mrs. Sydney Percy-Lancaster at Salisbury, S. Rhodesia, Aug. 11, 1960. We extend condolences to Mr. Percy-Lancaster in his very great loss.

THE NATIONAL AMARYLLIS JUDGES COUNCIL

Mrs. B. E. Seale, Chairman,
4036 Prescott Ave., Dallas 19, Tex.

Mr. W. D. Morton, Jr., Secretary, and Registrar of Amaryllis Names,
3114 State Street Drive, New Orleans 25, La.

OFFICIAL AMARYLLIS JUDGING INSTRUCTORS

Mrs. A. C. Pickard,
1702 N. Blvd., Houston, Tex.

Mr. W. C. Strain,
563 Mohawk Street, Mobile, Ala.

Mrs. A. J. Haydel,
516 Gordon Ave., New Orleans 23, La.

Mr. Robert E. Parker,
3051 Baronne St., Mobile, Ala.

Mrs. Sam Forbert,
117 N. 23rd Ave., Hattiesburg, Miss.

____________________ *
Corpus Christi, Tex.

Mr. & Mrs. Guy Rice,
606 Gornto Road, Valdosta, Ga.

* To be appointed later.

The Chairman, and Secretary of the Council function also as Official Instructors.

EXAMINATIONS.—Those desiring to take the examination for the Official Amaryllis Judge's Certificate should preferably apply to the

nearest Official Instructor for details about taking the examination. All completed examination papers are to be submitted to the Secretary of the Council for the issuance of the American Amaryllis Society's Official Amaryllis Judge's Certificate. Papers are graded at the Society Headquarters and are kept in a permanent confidential file.

All who have passed the examination receive the Official Amaryllis Judge's Certificate; and they remain official accredited judges and members of the Council as long as they remain members of the Society.

See PLANT LIFE, vols. 13 through 17 for the roster of those who have passed the examination from 1957, when the Council was founded, to the present time.

LOCAL AMARYLLIS JUDGES COUNCILS.—Local Councils are authorized. The first one has been organized by Mrs. Pickard and associates in the Houston, Texas, area.

METHODS OF INSTRUCTION.—Official Instructors are authorized to make up their own instruction courses, always on the basis of the schedule, scale of points, and rules as approved by the American Amaryllis Society.

AMARYLLIS JUDGES CERTIFICATES

Since the last report in the 1960 AMARYLLIS YEAR BOOK (pages 27—28), the following AMARYLLIS JUDGE'S CERTIFICATES have been issued by the AMERICAN AMARYLLIS SOCIETY:

87. Mrs. Frank B. Burns, 8515 Pritchard Pl., New Orleans 18, La.
88. Mrs. R. L. Morgan, 2311 Grant, Houston, Texas.
89. Mrs. R. H. Schmuck, 10707 Shallowbrook Lane, Houston, Texas.
90. Mrs. L. A. Dusek, Box 431, Cameron, Texas.
91. Mrs. A. E. Neumann, 543 Herring Ave., Waco, Texas.
92. Mr. Kermit L. Warnash, 4018 Drummond St., Houston, Texas.
93. Mrs. A. J. Haydel, 516 Gordon Ave., New Orleans 23, La.
94. Mrs. A. L. Hammond, Route 1, Box 278, Angleton, Texas.

REVISED SHOW SCHEDULE FOR OFFICIAL AMARYLLIS SHOWS

I. HORTICULTURAL SECTION

1. Registered named clones, unnamed clones and seedlings, must be judged according to the specifications as to form and color in the Official Divisions of cultivated Amaryllis, Nos. 1 through 9 (see Traub—Amaryllis Manual (1958), Divisions 2 through 8, pp. 70—91 (hybrids); and Division 1, pp. 19-35; 252-299 (species)).

2. The Award of Merit (A.M.) may be awarded *only* for meritorious registered named Amaryllis clones and the Preliminary Commendation (P.C.) may be awarded for meritorious registered named clones, and to unnamed clones and seedlings exhibited by breeders.

3. The usual ribbons—1st, 2nd, 3rd and honorable mention—may be awarded for qualified exhibits of registered named clones, and also *to breeders* for unnamed clones and seedlings.

TABLE I. SCORE CARD FOR AMARYLLIS (SCALE OF POINTS)

Character scored:	Method of rating	Possible score: single cut specimen	Possible score: potted plants: one or more scapes
1. Perfection of flower shape	Rating is to be strictly within the division standard on the basis of beauty of form.	15	15
2. Conformity to flower color standard	No flower of inferior color is to be considered. Whenever possible rating is to be on the basis of a verifiable color standard (chart) in order to avoid errors due to differences in individual color preception	45	35
3. Flower size	Since flower size is dependent on the flower division, the sizes recognized in the particular division concerned should govern.	15	15
4. Length and character of scape (stalk)	The length of the scape should be considered in relation to the size of the flowers	5	5
5. Number of flowers per scape and number of expanded flowers (number of flowers per scape includes unexpanded and expanded flowers)	Only 3- or more-flowered scapes are eligible. For two *expanded* flowers per scape, allow 3 points; for three, allow 5, for four or more, allow 6 points. In miniatures, 2- or more-flowered scapes are eligible; allow 4 points for two expanded flowers; 6 points for three or more.	6	6
6. Number of scapes per plant	This category applies only to potted plant exhibits. Allow 8 points for one scape; 9 points for two scapes; 10 points for three or more scapes.	—	10
7. Fragrance	Allow 2 points for fragrance, not too faint or too strong; deduct 2 points if fragrance is lacking.	2	2
8. Foliage	This category applies only to potted plant exhibits; for foliage absence deduct 2 points; for foliage not much developed, allow 1 point; for well developed foliage, allow 2 points.	2	2
9. Condition of exhibit	Exhibits in prime condition are to receive the full allowable points; those failing to come up to standard are to be penalized accordingly	10	10
	Total possible score	100	100

4. Potted plant, and cut scape exhibits, with 3 or more florets per scape (umbel), under 2 and 3 above, are eligible to receive the PC and AM awards, and ribbon awards, which may be counted for the highest number of points toward the higher ribbon or other prize awards. The P.C. award is to count 1½ times, and the A.M. award is to count twice, the number of points allowed for the blue ribbon, toward the higher ribbon and other prize awards.

5. Breeders may exhibit unnamed clones and seedlings in the Breeder's Class as potted plants or cut scapes, and may receive the regular ribbon awards, and the Preliminary Commendation (P.C.) award if merited.

6. The exhibits under Division 1, Cultivated wild *Amaryllis* (D-1), from Brazil, Peru, Argentina, Bolivia, etc., are to be judged according to the descriptions of the species and varieties in Traub Amaryllis Manual (1958), pp. 19-35; 252-299.

7. The exhibits under each of the 8 Divisions—Long-trumpet hybrids (D-2); Belladonna hybrids (D-3); Reginae hybrids (D-4a & D-4b); Leopoldii hybrids (D-5a & D-5b); Orchid-flowering hybrids (D-6); Double hybrids (D-7); Miniature hybrids, (D-8); and unclassified hybrids (D-9)—may be grouped under each Division without reference to the country of origin, or they may be separated into classes by countries of origin—American Hybrids, Dutch Hybrids, South African hybrids, India hybrids, etc.

8. There may be a class for non-registered named clones, but such entries cannot compete with the registered clones. Such non-registered clones may receive ribbon awards *of different color* from the regular ribbon awards. Such different ribbon awards cannot be counted as points toward the higher ribbon or other prize awards.

> Consult Mr. W. D. Morton, Jr., 3114 State Street Drive, New Orleans 25, La., the Official Registrar, about names of such un-registered named clones. If un-registered names used are already occupied by registered clones, then it will be necessary to rename such un-registered clones.

II. FLORAL ARRANGEMENTS SECTION

Floral arrangements may be staged at Official Amaryllis Shows, but this is not a necessary requirement. The choice is with the Show Committee.

1. The regular type of floral arrangements that incorporate Amaryllis flowers and leaves together with other materials are eligible, and as such may receive ribbon awards, and any other higher awards usually provided.

2. Potted plant and cut scape exhibits with two florets per scape (umbel), may be entered in groups of three or more as a display. Such

group exhibits may receive special awards that do not count as points toward the higher ribbon or prize awards.

3. Displays in glasses of single florets cut from the umbel, in groups of 3 or more, may be exhibited as floral arrangements. Such group exhibits may receive special awards that do not count toward higher ribbon or prize awards.

PRESENTATION OF HERBERT MEDAL, 1960

Prof. Ira S. Nelson, faculty member of the UNIVERSITY OF SOUTHEASTERN LOUISIANA, Lafayette, La., was presented with the 1960 WILLIAM HERBERT MEDAL at a meeting of the HOUSTON AMARYLLIS SOCIETY, Friday evening, January 16, 1960, at the Garden Center. [Fig. 5] The

Fig. 5. Presentation of the 1960 HERBERT MEDAL by Mrs. A. C. Pickard in behalf of the AMERICAN AMARYLLIS SOCIETY to Prof. Ira S. Nelson at the Jan. 16 Meeting of the HOUSTON AMARYLLIS SOCIETY. Photo by Andrew A. Hanson.

presentation was made on behalf of the AMERICAN AMARYLLIS SOCIETY by Mrs. A. C. Pickard, of the HOUSTON AMARYLLIS SOCIETY. As the guest of the evening, Prof. Nelson spoke on his exploration trips to South America, and showed lantern slides of the many plants that he collected. The reader is referred to the 1960 issue of the AMARYLLIS YEAR BOOK for the autobiography of Prof. Nelson.

[ORGAN MTS. LETTER, continued from page 18.]

hear the wails of those who are forced to live there or lose their jobs . . . Still, I admit Brasilia is an interesting venture and probably worth while seeing for those who can afford it.

I shall soon send the bulbs before it gets too cold where you live.

[In an additional letter to Dr. Smith, dated Sept. 19, 1960, Mrs. Abendroth writes about other interesting matters.]

To-day I air-mailed you a small basket containing two *Amaryllis calyptrata* bulbs and seeds of this same species.

These two bulbs we collected in the wilds, on felled trees, some six weeks ago.** In our mountain rain forest, this *Amaryllis* grows often in a crotch of a tree, and sometimes in the layer of humus that covers the forest floor.

In the garden it does well in ordinary soil, in half shade. It blooms during the dry season, June to August. Its No. 1 enemy is the grub of a *Castnia* butterfly (black with large yellow or orange spots, flying very rapidly, in the evening). The butterfly lays its eggs (I counted 250) on the underside of the leaves. After hatching, the grubs will eat their way down the leaves into the bulb and hollow it out. The grub is black and has white rings and an orange head. It, or perhaps the *Amaryllis*, seems to contain some kind of poison, for when I fed its grubs to swiftlets, I was raising at the time, the little birds got limp. They later recovered on mealworms.

The bulbs I have in the garden, and that flowered last season and produced the seeds, are nearly twice as large as the ones I sent and are still full of sap. Each weighs over 500 gms. The parcel I mailed to you should not exceed that much.

** Thousands of **Amaryllis calyptrata** were brought to the ground when the trees were felled to make a highway.

AMARYLLIS ARTICLE AND PAINTING

In the November 1960 House Beautiful (pages 242-243; 253-254), Wyndham Hayward discusses the culture of Hybrid *Amaryllis*. This article is accompanied by a reproduction of a colorful *Amaryllis* painting by Gene McComas.

Fig. 6. **Amaryllis reticulata** var. **striatifolia** as grown by Douglas D. Craft, Chicago, Illinois, in 1959. Drawing by Douglas D. Craft.

2. SPECIOLOGY

[EVOLUTION, DESCRIPTION, CLASSIFICATION AND PHYLOGENY]

AMARYLLIS RETICULATA VAR. STRIATIFOLIA; AND HYBRID, 'MRS. GARFIELD'

DOUGLAS D. CRAFT, *Illinois*

On the 12th May 1958, the author received three blooming sized bulbs of *Amaryllis reticulata* var. *striatifolia* from Mulford B. Foster. They were planted in a soil mixture containing three parts leafmold, one part garden soil, five parts torpedo sand, one rounded tablespoon of bonemeal and one-half additional part sand. A wooden tub was used, eight to nine inches in diameter and seven to eight inches in depth. The tub was filled 1/3 full of drainage rock. To this was added a layer of sphagnum moss and then a layer of sand. Then was added the soil mixture described above and the bulbs were buried to their neck as they would seem to have been previously growing.

The tub is sunk outside during the summertime in the garden to its rim. Bright light but no sunlight is allowed to strike this species at any time during the day. In the past sunlight has seemed to "burn-down" all the leaves on this *Amaryllis*. The author waters this *Amaryllis* quite generously all through the year using discretion, however, when the plant would seem to be in semi-dormancy.

In the first part of October 1959, one bulb started to show a bud which indeed was a thrilling discovery. The one bulb bloomed on Thanksgiving Day—three flowers per umbel, two flowers in bloom at once, the third blooming as one began to fade. It was a lovely red-purple bloom with heavy netting and veining of a deeper red. These were hand pollinated but did not mature seeds.

This one flowering bulb, in the tub of three bulbs, had consequently stood dormant for almost a year when in August 1960 leaf growth started again. Three small offsets were produced in the past year. The early summer, late spring of 1959, all three bulbs showed vigorous and hardy leaf growth. The summer of 1960 very little growth has occasioned except that for the offsets—although there were regular two week feedings of "Spoonit" and liquid fish emulsion.

Conclusions to be drawn are that this is a most temperamental and sensitive *Amaryllis* species. It demands almost absolutely perfect drainage and would seem to enjoy generous waterings, and rather rich, probably forest, soil. Further growing over the years and experimentation may give some answers. Should this species be buried in the soil, should the bulb rest on the top of the soil, or should bulbs be buried to their neck as the author has been growing them? Reports of successes of other growers with this species would be gratefully received.

In addition, the author has two bulbs of the *Amaryllis reticulata* var. *striatifolia* hybrid—'Mrs. Garfield' imported from Calcutta last year. They were each potted separately and grew extremely verdantly last

year even with sunlight. Upon removing to the house for winter, all leaves died down and only now in August of 1960 (after almost a year) do they start to show new leaf growth. It may be that this hybrid goes through very long dormancy periods in this climate. The leaves and flowers of this old hybrid must be lovely and the author would appreciate help from others about growing hints. To date, there has been no bloom.

CRINUM VIRGINEUM

William Lanier Hunt, *North Carolina*

The fine white *Crinum* species pictured with my "Notes" in Plant Life: page 101. 1958, has now been identified by Dr. Traub as "near to" *Crinum virgineum* Martinus, in Schultes f., Syst. 7: 885; from south Brasil. I see that I had been hovering over this species in my copy of Herbert, Amaryllidaceae in former attempts to identify it. Dr. Traub says that he once grew *C. virgineum* in Florida in the 1930's but that it never set seeds. What we have may be a clone that requires pollen from another seedling for seed setting.

Apparently, this species might be crossed with its near relative, *C. giganteum*. The latter has evergreen foliage which cannot survive in frost country. Perhaps this method is our best hope for bringing more characters of the tender crinums into hybrids for the colder regions. Bulbs of the deciduous crinums have such a great store of food in them that, if they are not frozen, they will come up in the spring and burst into growth.

A great virtue of *C. virgineum*, aside from its pristine beauty, is the maintenance of the lily-like flowers in an upright position in the hot sun. Many crinums—especially those with the genes of *C. moorei* in them—sulk in the sunshine. They hang their heads down and refuse to open more than half-way in the daytime. For this reason, the majority of crinums that we grow are really effective only in the early morning or in the evening. During the day, they are sad looking indeed.

THE AMBOINA CHALICE LILY, EURYCLES AMBOINENSIS

Hamilton P. Traub, *California*

In the fall of 1950, Dr. Moldenke forwarded to the writer a "flattened ball" of vegetation, apparently representing an amaryllid, that had been received for identification. After this mass of vegetation was soaked in warm water over night and carefully straightened out and re-dried, a fairly presentable herbarium specimen (Traub Herbarium No. 450 (TRA), *Eurycles amboinensis* (L.) Lindl.) was prepared from this unpromising material.

Under date of Oct. 6, 1950, Elizabeth McClintock, Assistant Curator in Botany, California Academy of Science, San Francisco, Calif., wrote

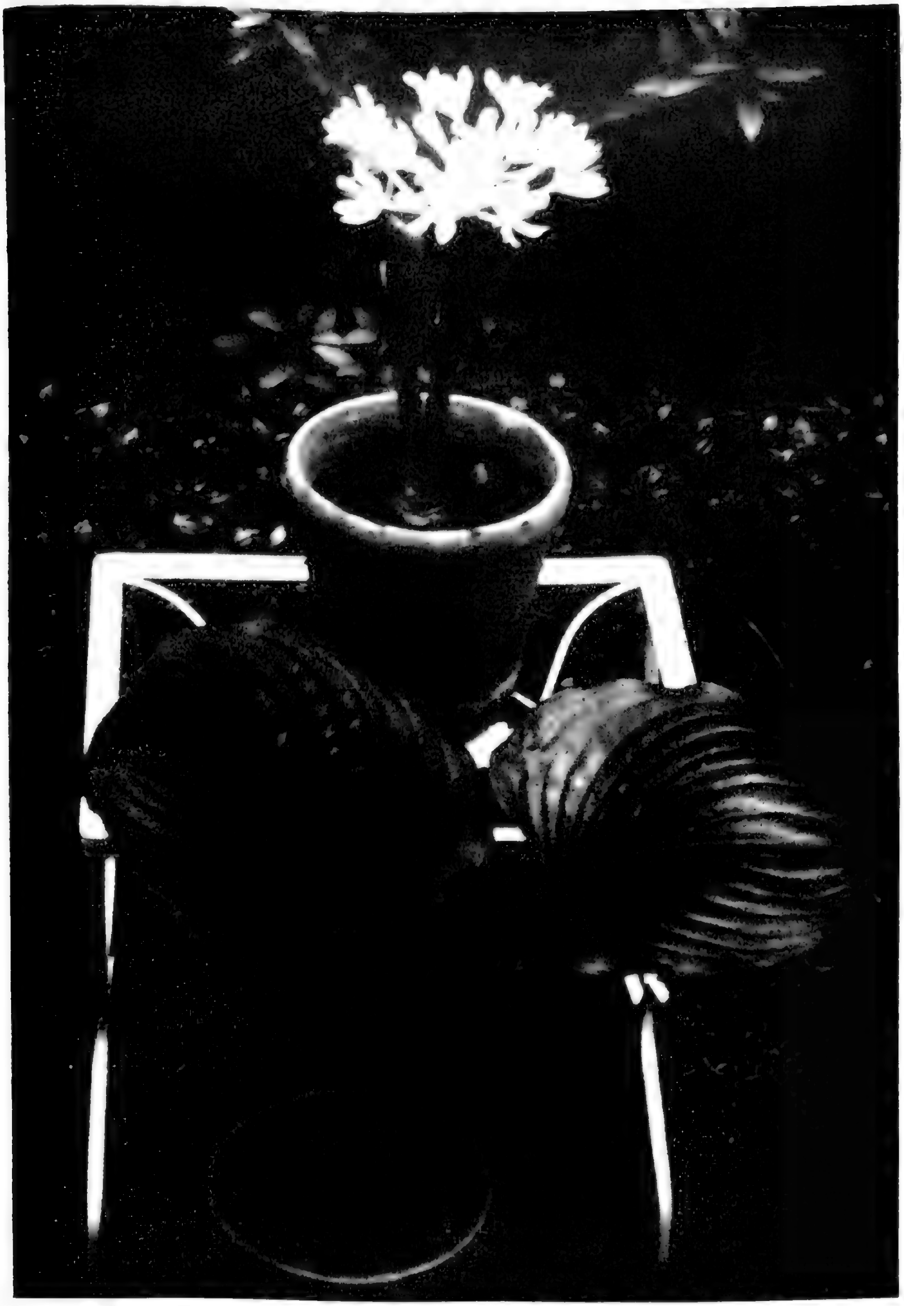


Fig. 7. The AMBOINA CHALICE LILY, *Eurycles amboinensis*, grown in Houston, Texas, from a bulb brought from New Caledonia by a military service-man stationed there after the war. Reproduced from a kodachrome.

as follows: "Some weeks ago I sent a specimen of an Amaryllid to Dr. Moldenke for determination. The specimen, a scrappy thing, had been sent to me by Mr. Edward Teas of Bellaire, Texas, with the explanation that it had been grown by someone in Houston from a bulb brought from New Caledonia by a service-man stationed there after the war. Dr. Moldenke wrote me subsequently that he had sent the specimen to you. Today I received the enclosed kodachrome of the plant which I thought you might be interested in seeing . . . You may keep it as Mr. Teas did not ask to have it returned. I am sorry the specimen was such a poor one."

Fig. 7 is a reproduction of the plant, *Eurycles amboinensis*, in flower from the kodachrome mentioned above.

When the writer wrote to the Teas Nursery a few years ago, Mr. Edward Teas had passed away, and his son could not trace the source of the plant. Thus it was not possible to obtain offsets or seeds of this introduction from New Caledonia(?). It is hoped that this notice will be of service in locating the ex-service man who brought in the bulb since it is important to find out if the bulb was collected in the wild in New Caledonia. If so, then the range of this plant has to be amended to include that habitat. If this illustration with explanation could be published in the Houston, Texas, newspapers, it might be possible to reach the ex-service man.

NATIVE HYMENOCALLIS

CAROLINE DORMON, *Louisiana*

Our native *Hymenocallis* deserve more attention from gardeners for their beauty and adaptability. They are rarely listed in trade catalogs but are advertised in State Market Bulletins as "White Spider Lilies." The name AMERINDIAN CHALICE LILIES, in reference to the native race and the prominent staminal cup, is more appropriate. The chalice is important since it sets the genus apart from *Crinum Americanum* with which it is sometimes confused by the amateurs.

[EDITORIAL NOTE.—The genus *Hymenocallis* is at present divided into two subgenera—(a) subg. *Hymenocallis*, in which the stamens are more or less straight, and distributed from the West Indies to South America, westward to Central America, Mexico and southern Texas, and northward to Southeastern United States as far north as Kentucky and Indiana, and westward to Arkansas, Oklahoma and northern Texas. (b) subg. *Ismene*, in which the stamens are more or less incurved, and distributed in the Andes of South America.

Although Sealy (Kew Bull. 201-240. 1954) has revised the subgenus *Hymenocallis*, his work is based mainly on dried specimens at Kew and the British Museum since he was apparently unaware of the numerous specimens of the southeastern United State species in the Traub Herbarium. These were the result of the extensive field collections of living plants by Mrs. Mary G. Henry. The living specimens were studied in the greenhouse at Beltsville, Maryland, and specimens were preserved.*

* The Holotype of **Hymenocallis palmeri**, by H. P. Traub, Taxon **8:** 195-196. 1956.

Hymenocallis kimballiae Small, emend., by H. P. Traub, Plant Life **12:** 44-46. 1956.

M. E. Jones **Hymenocallis** specimens, by H. P. Traub & R. K. Vickery, Jr., Plant Life **12:** 43-44. 1956.

When this material is brought to bear in a further revision of the genus, it will be possible to arrive at a more nearly definitive picture of the Southeastern United States species of *Hymenocallis*. This is particularly true since Dr. W. S. Flory and

Fig. 8. Amerindian Chalice Lily, **Hymenocallis** sp., from Castor, Louisiana. Flowers white, produced in August. Approx. ½ [0.53] natural size. Drawing taken from **Flowers Native to the Deep South,** by the author.

his associates at Blandy Experimental Farm, Boyce, Virginia, are engaged on a chromosome study of the same material. Living plants of the Mexican species for this project have been collected by Mr. & Mrs. Morris Clint.—*Hamilton P. Traub*]

About thirty years ago, I observed the August-blooming group for the first time. In an open pasture, near Castor, Louisiana, there were

big clumps of these exquisite flowers. I wrote to a reputed authority and also searched every available botany, but *not one* told of a species which bloomed in late summer, long after the leaves had disappeared.

The Castor, Louisiana plant is described as follows:—The broad glaucous leaves, which are quite ornamental, appear in late winter, and die off in late spring. The latter part of August, the showy flowers (see Fig. 8) appear as if by magic. The stems are stout, pale glaucous-green, with an odd twist near the top. They are 2 to 3 feet in height, topped with an umbel of snow-white flowers, each 8 inches from tip to tip of segments. Three segments are folded, three flattened, the latter 1 cm. in width. The staminal cup is 2½ inches in diameter, the edges somewhat lacerate, with sharp points. The flowers are very fragrant, especially at night. This species occurs in heavy soil, near streams that occasionally overflow in spring, but become dry in summer. However, the plants are very adaptable, blooming freely when planted in sandy soil. The leaves and the plant habit will be illustrated in an additional note to be included in the next issue.

The flowers of the spring-blooming species are not so large, but showy when growing in masses. The blooms come with the leaves, which are shining green. Our most widely distributed species, forms a conspicuous feature of the landscape in South-central Louisiana. In April, the sheets of white flowers may be seen from Highway 71, between Lebeau and Alexandria, Louisiana. There is also a dwarf form from the vicinity of Prairieville, with stems only 12 inches in height, and rather narrow shining green leaves. And in Northeast Louisiana there is a much taller species, with flower largest of the spring-blooming forms. All are very fragrant.

Our Louisiana forms may include several species, and we look forward to the further revision of the genus.

Specimens of the local Louisiana *Hymenocallis* species known to me have been sent to Doctors Traub and Flory so that these species may be fully covered in the chromosome studies and the revision of the species. Others in the Southeastern United States are requested by these workers to send in living material to be included in the project.

AUSTRALIAN CHALICE LILY—CALOSTEMMA

HAMILTON P. TRAUB, *California*

Before the last war, *Calostemma purpureum, C. purpureum* var. *carneum, C. luteum* and *C. album* had been introduced into the United States, but unfortunately due to dislocations of the war, only *C. purpureum* appears to be in cultivation here at present. This brief note is published in the hope that our Australian friends will send us the missing species in exchange for other amaryllids.

Calostemma purpureum R. Brown thrives here at La Jolla outdoors in well-drained sandy loam. It makes upright linear leaves, and blooms in late summer and fall; a single bulb usually produces up to four tall

scapes in succession which arise from the center of the bulb. The flowers are self-fertile and thus the seeds set freely. Although the purple flowers are rather small for such a robust scape, they make a colorful addition to the garden in late summer and fall.

When planted in pots or in clay loam outdoors at La Jolla, *Calostemma purpureum* remains alive but does not bloom. This may be due to the local water supply which is slightly alkaline. At Beltsville, Maryland, in the greenhouse in the 1950's under pot culture, and given the local non-alkaline water, it thrived and bloomed regularly.

Baker (Amaryll., 1888) indicated that the leaves were produced after the flowers but this is not the case under cultivation here where the flowers are produced with the flowers.

The following description of the species is presented for the information of those who are interested in the CHALICE LILIES:

Calostemma purpureum var. **purpureum**

Rootstock a tunicated **bulb; leaves** several, linear, produced with the flowers (in cultivation at La Jolla, Calif.), up to 33 cm. long, green, rather thick, 9 mm. wide at the base, 11—12 mm. wide at the middle, narrowed, rounded at the apex; **scape** solid, spinach green, flattish with rounded edge, sometimes somewhat 3-edged in lower 2/3, 51—66 cm. tall, 9 x 12 mm. diam. at the base, 4 x 6 mm. diam. at the apex; **spathe** 2-valved, lanceolate, 2.3—2.5 cm. long, apex acute; **umbel** many-flowered, flowers fragrant, dianthus purple (HCC-730/3; DCN 254. vivid purplish red), flowers held more or less upright; **pedicels** 1.6—2.6 cm. long; **ovary** roundish, 2.5 mm. long, 3.5 mm.. diam.; **tepaltube** 7—8 mm. long, 2.25 mm. in diam. at the base, 2.5 mm. diam. at the apex; **tepalsegs** spatulate, apex rounded, 1.3 cm. long, **setsegs** 7 mm. wide, **petsegs** 6 mm. wide; **staminal cup** 1 cm. long, two short teeth between the filaments, purplish in lower 2.3, whitish-yellowish in upper 1/3; **filaments** 3 mm long, filiform, **anthers** 2 mm. long, 0.5 mm. diam., **pollen** yellow; **style** white, slightly shorter than the stamens; **stigma** capitate, minute; **fruits** 1-seeded, indehiscent, green overlaid with rusty-reddish in upper part, oblique, usually 10-11-12 mm. long, 10 x 13—11 x 13—11 x 14—12 x 14 mm. in diam, rarely much smaller, 6 mm. long, 5 x 7 mm. diam.; **seeds** oblique, shiny-green, fleshy, placental attachment to one side at the base of the fruit, 9.75—10.75—11.75 mm. long, 9.75 x 12.75—10.75—12.75—11.75 x 13.75 mm. in diam., rarely much smaller, 5.75 mm. long, 4.75 x 6.75 mm. diam.

Specimen: Traub no. 805 (TRA), Aug. 5, 1960, cult. outdoors, La Jolla, Calif

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The genus **Calostemma** was founded by Robert Brown in 1810. At present three species are recognized; all confined to Australia.

CALOSTEMMA R. Brown (Prod. 297. 1810)

Rootstock a tunicated **bulb; leaves** linear or petiolate, produced with or after the flowers; **scape** solid, flowers many in an **umbel,** white, yellow or purple; **tepaltube** narrowly funnel-shaped; **tepalsegs** oblanceolate, spatulate or oblong, equal, ascending; **stamens** inserted at the throat of the tepaltube; filaments united into a **staminal cup** in lower part; free **filaments** ascending; **anthers** small, oblong, versatile; **ovary** by abortion 1-celled; ovules 2—3 per locule; **style** filiform; **stigma** capitate; **fruit** 1-seeded, indehiscent, oblique; **seed** fleshy, green, oblique.

KEY TO THE SPECIES OF **CALOSTEMMA**

1a. Leaves linear:

2a. Flowers pale to dark purple, or white .... 1. **purpureum**

3a. Flowers dark purple; tepaltube shorter than the tepalsegs (So. Australia and New South Wales) .... 1a. **purpureum** var. **purpureum**

3b. Flowers larger, pale purple or white; tepaltube as long as the tepalsegs (So. Australia and New South Wales) .... 1b. **purpureum** var. **carneum**

2b. Flowers bright yellow:

Tepaltube about ½ as long as the tepalsegs; flowers larger than in **purpureum** (Queensland and New South Wales) .... 2. **luteum**

1b. Leaves petiolate

Flowers white, conspicuous entire bifid teeth between the filaments. (Gulf of Carpenteria, Queensland and Northern Territory) .... 3. **album**

FRAGRANCE AND FLOWERING TIME IN HYBRID AMARYLLIS

H. J. N. v. Woesik, *Manager, Ludwig & Company*

[Under date of July 12, 1960, Mr. Woesik writes as indicated below in response to our communication.—*Hamilton P. Traub*]

"Your communication arrived too late for notes on fragrance to be included in our 1960 catalog. By the time it was received, the text of this year's new Amaryllis Catalog was already being printed so that we could not add anything about fragrance, if any is present, in our named *Amaryllis* clones. Some of them indeed have some fragrance, but we never thought much about it. Anyhow, we shall give this serious thought, and add such information in next year's edition of our Amaryllis Catalog. What we have added in this year's edition (which will be published in early August) is the time when our named *Amaryllis* clones flower; that is, the time between planting or potting and the actual production of flowers. This should help a good many Amaryllis-lovers to have our named *Amaryllis* clones in full bloom simultaneously for the Amaryllis Shows."

A MINIATURE AMARYLLID, EUCHARIS FOSTERI

Douglas D. Craft, *Illinois*

This amaryllid was received a short time after receiving *Amaryllis blumenaria* and *A. reticulata* var. *striatifolia* from Mulford B. B. Foster in 1958. Using the same soil formula and potting directions as for above *Amaryllis*, *Eucharis fosteri* was brought to bloom this June-July (1960) for the first time (Fig. 9). It is easily grown and has increased itself by three offsets already. Its leaves are most ornamental and florets in the umbel opened one at a time. The florets are shaped somewhat like

Fig. 9. Miniature amaryllid, **Eucharis fosteri**, as grown by Douglas D. Craft, of Chicago, Illinois, 1960. Drawing by Douglas D. Craft.

Amaryllis blumenavia, but are smaller. They are pure white; giving a most pristine look to the flower. It is a lovely *Eucharis* and well worth a gardener's loving care. Leaves and flowers both appear almost to be made of wax.

GALANTHIMINE, A NERVE STIMULANT

According to press reports, Mikhail Mashovsky, Head, Pharmacological Dept., Moscow Chemical Institute, has emphasized that the new drug—the alkaloid galanthimine, extracted from the amaryllid *Galanthus woronowii* Losinsk.; see Herbertia 14: 114. 1947 (1948)—is not a cure and cannot restore destroyed nerve tissue, but can be used to stimulate the nerves of polio victims and those suffering from other types of paralysis. (Continued on page 57.)

AMARYLLID GENERA AND SPECIES

HAROLD N. MOLDENKE

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Allium cyaneum Regel, (in Act. Hort. Petrop. 3: 174. 1975), var. *stenodon* (Nakai & Kitagawa) Kitagawa in Rep. Inst. Sci. Res. Manch. 6: 120. 1942; in Journ. Jap. Bot. 29: 166. 1954.

Syn.—*Allium stenodon* Nakai & Kitagawa in Rep. First Sci. Exped. Manch. Sect. 4 (1): 18, plate 6. 1934.

Rhizome horizontally creeping, slender, whitish; bulb elongate, cylindric, slightly ovate-swollen at the base, the coat (tunic) dirty-white, mostly dissolved (broken-up) into net-like (reticulated) fibers; stem commonly solitary, to 50 cm. tall, erect but often arcuate at the apex, green, terete, more or less angulate-striate, leafy only at the base; leaves very narrowly linear, flat, supple, shorter than or equaling the stem, green, to 3 mm. wide, gradually acute at the apex, minutely scabrous under a handlens along the margin; capsule-bearing umbels many-flowered, fastigiate or hemispheric; spathe 1-valved, ovate, long attenuate-acuminate at the apex, thin, white-scarious, mostly longer than the pedicels; pedicels green or becoming bluish, 5—9 mm. long, acutely subalate-angular, smooth, naked at the base or bearing minute whitish bractlets; segments of the perigonium blue, elliptic or ovate-elliptic, 4.5—5.5 mm. long, very obtuse, almost entire along the margins, the exterior ones slightly shorter than the interior ones, the mid-nerve more intensely colored; filaments 8—9 mm. long, glabrous, blue, the 3 exterior ones dilated at the base, the 3 interior ones furnished with a lanceolate or broadly lanceolate-triangular acute tooth on both sides; anthers yellow, often becoming bluish, oblong-elliptic, 2—2.3 mm. long; style greatly exserted, whitish, smooth, filiform, not incrassate at the apex; ovary glabrous; fruit unknown.

Japanese common name: ruri-negi, according to T. Nakai.

It grows on the mountain Wu-ling-shan; type collected by Nakai, Honda, & Kitagawa on September 2, 1933.

Allium prostratum Treviranus, in Ind. Sem. Hort. (1821),-Syn.—*Allium satoanum* Kitagawa, in Bot. Mag. Tokyo 48: 92. 1934.

Rhizome horizontally creeping, branched, rather thickened, giving off slender reddish roots; bulb solitary, oblique, ovate-oblong, obliquely rounded at the base, about 1.5 cm. long, 6—8 mm. in diameter, coats membranaceous, the inner ones

whitish and entire, the outer ones becoming reddish, subentire, and more or less irregularly split; stems erect or more or less arcuate at the apex, to 14 cm. tall, 1 mm. in diameter, slender, very obsoletely alate-angled, glabrous, surrounded at the base by the leaf-sheaths; leaves few, shorter than the stem, 1 inner-filiform, obtuse at the apex, slightly more flattened on the upper surface, 1-nerved, 3-ribbed beneath, scabrid-papillose under a handlens along both margins, about 1 mm. wide; spathe scarious, 2-valved, the valves very broadly ovate, slender-nerved, half as long as the pedicels; capsule-bearing umbels many-flowered; pedicels 5.5—6 mm. long, bracteolate at the base, smooth, filiform, the bractlets white-hyaline; flowers campanulate, purple; tepals equally long, 3.5 mm. long, the outer ones elliptic-ovate, rounded-obtuse at the apex, entire along the margin, 1-nerved, membranaceous, the inner ones elliptic-obovate, rounded at the apex, minutely denticulate along the upper margin, 1-nerved, membranaceous; outer filaments manifestly surpassing the tepals, dilated at the base, 1-nerved, entire along the margin, the inner ones broader, scarcely surpassing the tepals, gradually dilated at the base, 1-nerved, entire along the margin; anthers ovate, yellow, dorsifixed; style filiform, glabrous, whitish, 2.5—3 mm. long; stigma capitate-punctiform, scarcely incrassate; ovary obvate-globose, verruculose-scabrous, about 1.3 mm. long; capsule unknown.

Japanese common name: môko-rakkyô (first recorded here).

Type collected by J. Satô in dry meadows at Man-chou-li, Manchuria, on August 20, 1927. Endemic.

Allium tenuissimum L. Sp. Pl. p. 301. 1753. Syn.—*Allium elegantulum* Kitagawa, in Rep. First Sci. Exped. Manch. Sect. 4(11): 98. 1935.

Roots fibrous, simple, becoming darkish, numerous; rhizome creeping; bulbs conic-cylindric, cespitose, few, to 4 mm. thick, the coats membranous, the outer ones dirty-blackish and irregularly split, the inner ones becoming violet and entire; stems erect, straight, very slender, filiform, completely glabrous, very smooth, more or less alate-ribbed-striate, green, leafy only at the base, to 16 cm. tall, as slender at 0.5 mm.; leaves shorter than or surpassing the stem, very narrowly filiform, rather more flattened on the upper surface, few-angular-ribbed beneath, glabrous or slightly scabrous along the margin; capsule-bearing umbels erect, many-flowered, fastigiate; bracts thinly hyaline-membranaceous, 1-valved, almost equaling the pedicel, acuminate-cuspidate at the apex, 4.5—5 mm. long; pedicels smooth, subalate-ribbed, short, naked at the base, 4—5 mm. long; perianth campanulate, 3.5 mm. long; the 3 outer tepals shorter than the inner ones, elliptic, rounded at both ends, white-scarious, 1-nerved, 3 mm. long, 1.8 mm. wide, the 3 inner ones cuneate-obovate, subtruncate at the apex and more or less denticulate, cunneate at the base, 1-nerved, very brightly deep-purple, scarious, 3.5 mm. long, to 2 mm. wide; stamens all shorter than the perianth; filaments white, connate among themselves at the base, the outer ones narrow, slightly dilated at the very base, completely glabrous, 1.7 mm. long, the inner ones narrowed above the middle, completely glabrous, greatly dilated below the middle and minutely-papillose-denticulate along the margin, 2.1-2.3 mm. long; anthers broadly ovate, yellow, about 1 mm. long, the connective extended at the apex into a short obtuse mucro; ovary subglobose, more or less scabrous, purple, 1 mm. long; style white, stigmatiferous at the apex, not incrassate, glabrous, 1.1 mm. long; fruit not seen.

Japanese common name; tigo-rakkyô (first recorded here).

The type was collected by M. Kobayashi (no. 22) on the mountain An-tzo-shan near Hsia-chia-hê-tzu, Manchuria, on August 17, 1934; endemic.

Allium saxicola Kitagawa, in Rep. Inst. Sci. Res. Manch. 2: 288. 1938.—Related to *A. senescens L.* (in the strict sense) and *A. montanum* Schmidt, but easily distinguished from the former by its more slender habit, the rhizome more branched, the stem slender, the narrow leaves surpassing the stem, acute, softer, greenish, the umbels hemispheric, not globose, and the flowers fewer and smaller, and from the latter by the leaves surpassing the stem, more acute at the apex, the umbels more loose, the flowers fewer, and the pedicles longer.

Rhizome horizontally creeping, branched, thick, dark, bearing slender fibrous roots which are simple and pale-fuscous; bulb solitary, almost cylindric, slightly inflated at the base; coats membranous, the inner ones white and entire, the outer ones sordid and irregularly more or less lacerate; stems erect, slender, about 30 cm. tall,

2-edged toward the apex, terete below, greenish, smooth, leafy only at the base; leaves many, shorter or longer than the stem, very narrowly linear, plano-convex, soft, greenish, acute, glabrous on both surfaces, very minutely papillose-scabridous under a handlens along the margin, to 3 mm. wide; capsule-bearing umbels terminal erect, many-flowered, rather densely flowered, hemispheric; spathe not examined; pedicels very slender, angular-alate, more or less scabridous on the angles, few-bracteolate at the base, to 1.5 cm. long, the bractlets minute, white-scarious; flowers rotate, pale-rose; tepals completely glabrous, rather shiny, 1-nerved, narrowly elliptic, the outer ones 4.5. mm. long, the interior ones longer, 5 mm. long, entire on the margin; filaments all toothless, the outer ones subulate, gradually dilated toward the base, 5 mm. long, the inner ones subulate above, rather abruptly dilated below, 5 mm. long; anthers narrowy elliptic, yellow, about 2 mm. long; ovary glabrous, smooth; style filiform, 6 mm. long, glabrous, punctate-stigmatiferous at the apex; capsule 5 mm. long, dark; seeds black, angular-costate, minutely reticulate.

Japanese common name: iwa-rakkyô (first recorded here).

Found in southern Manchuria. The type was collected in rocky places near Lao-hu-tan, prov. Fên-tien, by M. Kitagawa on August 30, 1930, and is deposited in the herbarium of Tokyo Imperial University. It was also collected by M. Kitagawa near Ling-shuei-szu in October 1926, and at the same place by J. Satô (no. 7) in August 1926.

Allium hopeiense Nakai in Jour. Jap. Bot. 19: 316. 1943.—Cespitose-congested; bulb narrow, about 3 cm. long, dark-coated; leaves white-sheathed at the base, truncate at the mouth, the limb flat, narrow, 1 mm. wide, 9—18 cm. long, completely entire on the margin; scape 10—14 cm. beyond the mouth of the sheath, narrow, 1—1.5 mm. wide; bracts hyaline, ovate, 5 mm long, mucronate-cuspidate at the apex; flowers 2—8 per umbel; pedicels 2—3.5 mm. long, glabrous; sepals very broadly ovate, becoming purplish, the midrib deep-purple, 3.5—4 mm. long and wide, concave, rather acute at the apex; stamens 5—6 mm. long; filaments dilated at the base, not winged; anthers 1 mm. long, elliptic, dark-purple; style glabrous, 4.5 mm. long, becoming purplish; stigma punctate.

Japanese common name: hokusi-yamabiru.

The type was collected on the mountain Hsiao-wu-tai-shan, in Hôpeh, China, by Takenaka-Yô (no. 187) in August 1938, and is deposited in the herbarium of the Botanical Institute, Faculty of Science, Tokyo Imperial University.

Allium kungii Nakai, in Jour. Jap. Bot. *19:* 316. 1943.—Rhizome very short, crustaceous; bulbs ascending, narrowly ovate, congested, covered with white membranous coats; leaves sheathing at the base, oblique at the mouth, the limb 9—11 cm. long, flattened or slightly concave, 1—1.2 mm. wide, green; scape 19—25 mm. tall, 1.2—1.5 mm. wide, hollow, very terete; bracts white-membranaceous, very broadly ovate, 4—5 mm. long; flowers polymerous, congested; pedicels 6—7 mm. long; tepals purple, lanceolate, deeply colored on the midrib, 4 mm. long, 1—1.5 mm. wide, slightly saccate at the base; stamens exserted, 5 mm. long; filaments becoming purplish, lanceolate, gradually attenuate above the middle; anthers purple, 0.8 mm. long, versatile; style white, 4 mm. long; stigmas punctate.

Japanese common name: godai-rakkyô.

The type was collected on the mountain Hsiao-wu-tai-shan, in the province of Hôpeh, China, by Takenaka-Yô (no. 190) in August 1938, and is deposited in the herbarium of the Institute of Botany, Faculty of Science, Tokyo Imperial University.

Allium virgunculae F. Maekawa & Kitamura in Acta Phyt. Geob. 14: 148. 1952.—Bulbs aggregate, producing copious stout roots, narrowly oblong, 5—7 mm. wide, 2 cm. long when dry, the outer coats membranaceous, pinkish-white; stem erect, mostly 15 cm. (8—22 cm.) tall, slender, about 0.8 mm. in diameter, terete, striate, glabrous, without leaves; leaves 3—5, spreading, linear, glabrous, dark-green, densely white-punctate, 10—20 cm. long, 1 mm. wide, not hollow; capsule-bearing umbels loosely 2—12-flowered; bracts white, membranaceous, broadly ovate, about 5 mm. long, acuminate at the apex, clasping at the base; pedicels 12—15 mm. long, glabrous; perianth rosy, broadly ovate, 5.5 mm. long, 3—4 mm. wide, obtuse; filaments 6 mm. long, the outer ones simple and subulate, the inner ones dilated at the base and acutely 1-dentate on each side; style long-exserted, 2.5 mm. long;

capsule 4 mm. long, 5 mm. wide, glabrous; seeds compressed, oblong, black, 4 mm. long.

Japanese common name: ito-rakkyô.

The type was collected in wet depressions on Mount Byobu, 100—200 meters altitude, Hirato Island, province of Hidzen, Kiusiu, Japan, by S. Kitamura and M. Tamura on November 15, 1950. It may be distinguished from *A. bakeri* by the smaller bulbs, shorter stems, smaller and not hollow leaves, and fewer flowers.

Allium yesoense Nakai in Bot. Mag. Tokyo 26: 117. 1922.—Related to *A. splendens, A. lineare,* and *A. strictum,* but distinct from all these by its broader leaves, whitish tepals, and shorter filaments.

Bulb covered by reticulated coats; scape 5 mm. thick below and 3 mm. thick toward the apex, hollow, leafy below the middle; leaves 4—7 mm. wide, flat, sulcate at the base; spathe whitish, membranous, very large, slightly shorter than the flowers; pedicels thickened at the apex; tepals ovate, submembranous, whitish, green on the back, 5 mm. long; stamens 6 mm. long; filaments dilated at the base, obtuse; anthers whitish; ovary globose, 3-sulcate; styles simple, shorter than the stamens.

Japanese common name: yeso-rakkyô.

Collected by T. Nakai at Zenibako, province Ishikari, Yeso, in sandy places.

Allium togashii Hara in Journ. Jap. Bot. 28: 62. 1953.—Bulb oblong, 1.5—2.5 cm. long, 6—10 mm. thick; outer coats dark-gray or becoming brownish, finally densely reticulate-fibrous; roots filiform, about 1 mm. thick; rhizome oblique, short, 3-5 mm. thick; false stem 2—4 cm. tall, about 2 mm. thick; leaves distichous, 3 or 4, congested, narrowly linear, fleshy, 12—20 cm. long, 1.2—2 mm. wide, flat, lightly 3-carinate on the back, almost solid, green, flat in vernation; scape 12—25 cm. tall, 1.5 mm. thick, terete; inflorescence umbellate, about 20-flowered, without bulblets; spathe white-membranous, about 5 mm. long; pedicels filiform, ascending, 6—12 mm. long; flowers whitish, more or less open, about 8 mm. in diameter; tepals oblong, concave, slightly 1-carinate on the back, obtuse at the apex, very minutely denticulate, the outer ones about 3.5 mm. long, 1.5 mm. wide, the inner ones longer, about 4 mm. long, 1.8 mm. wide; stamens long-exserted from the tepals, about 6 mm. long, about equally long; outer filaments subulate-linear, flat, the inner ones dilated at the base, about 1 mm. wide, 1- or 2-denticulate on each side almost toothless; anthers about 1.2 mm. long; ovary rounded, about 2 mm. long, 3-celled, with 2 ovules in each cell, with 3 open hollows at the base between the sepals; style subulate, 1—5 mm. long, not divided; capsule rounded, 4—4.5 mm. long, 3—4.5 mm. in diameter; seeds black, more or less compressed, about 3 mm. long.

Found tufted in dry depressions among rocks, at about 700 meters altitude, at Kankakei, on Shôdo-shima Island, province of Sanuki, by M. Togashi on October 5, 1952. The type was cultivated in Tokyo, collected in flower on July 16 and in October, 1952, deposited in the herbarium of Tokyo University.

In the *A. odoratum* group this new species is striking in having small obtuse tepals and long-exserted stamens.

Allium (Schoenoprasum) wakegi Araki in Jour. Jap. Bot. 25: 206. 1950; *Allium fistulosum* (L.) var. *caespitosum* (non Makino 1905) Makino in Iinuma, Sômoku-Dzusetsu ed. 3; 2; p. 475, plate 363 (1910, excel. descript. addend. et Icon. analyt. addend.)

Icones Iinuma, Somoku-Dzusetsu Vi fol. 34 rect.

This new species is related to *A. fistulosum* L., but differs in the plant being much smaller, conspicuously cespitose and the bulbs much smaller and abundantly aggregate. It is also similar to *A. ascalonicum* L., but differs in the stamens surpassing the perigonium and the filaments being without teeth. From *A. bouddhae* A. Debeaux it differs in having the bulbs dormant and the connective of the anthers short-appendaged at the apex.

Perennial herb, dormant after anthesis, densely cespitose, completely glabrous, slightly disagreeably-odorous; roots biennial, fibrous, numerous, white; rhizome very short, yellowish, becoming brownish; dormant bulbs oblique-ovate, acute at the apex, obtuse at the base, 23—35 mm. long, 8—18 mm. in diameter, covered by dark, dried-up, membranous coats; living bulbs with false stems that are rather terete or subterete, slightly inflated below, 10—12 cm. long, the inflated part 0.6—1.2 cm. in diameter, above that 0.5—0.7 cm. in diameter, the underground portion white, often

covered by the dark dried-up coats, the above-ground portion pale green; leaves 3 or 4, radical, distichous, 30—40 cm. long, the sheaths tunicate, obliquely truncate at the mouth, the blades terete-fistulose, attenuate-acuminate at the apex, slightly narrowed at the base, 12—25 cm. long, 0.4—0.7 cm. in diameter, slightly pruinose, green, thin in texture; scapes very few, terminal to the bulb, issuing from the mouth of the sheath, slightly depressed-fistular, solid below, 30—40 cm. long, 0.8—0.9 cm. wide, 0.7—0.8 cm. thick, narrow at the base, below the middle very slightly inflated, gradually narrowed to the apex, very lightly pruinose, bluish-green; spathe saccate,

Allium saxicola Kitagawa, in Rep. Inst. Sci. Res. Manch. 2: 288. 1938.—Related elliptic, caudate-acuminate at the apex, 20 mm. long, 8 mm. in diameter, finally 2-(1—3-) split, membranous, white, with the ribs reddish below, marcescent; inflorescence erect, umbelliform but centrifugal, small many-flowered, finally semiglobose, 1.8—2.2 cm. long, 2—3 cm. in diameter; pedicels filiform, not angular, 8—13 mm. long, 0.5—0.7 mm. in diameter, greenish; buds ovate, acute at the apex, truncate at the base, trigonous; flowers usually sterile; perigonium half-open, campanulate, marcescent; tepals free, the 3 outer ones slightly navicular, ovate, acute to obtuse at the apex, rounded-truncate at the base, 3.5—4 mm. long, 2 mm. wide, membranous, white, with the midribs green, the inner 3 very slightly navicular, oblong, acute at the apex, rounded-truncate at the base, 4.5—5 mm. long, 2 mm. wide, otherwise like the outer ones; stamens 6, finally 7—8 mm. long, greatly surpassing the perigonium, marcescent, often imperfect; filaments filiform, without teeth, dilated at the base, connate among themselves at the base and slightly adnate to the base of the tepals, upwardly attenuate, white; anthers versatile, lateral, longitudinally dehiscent, oblong, obtuse at the apex, cordate at the base, 1.3—1.5 mm. long, 0.6—0.8 mm. wide, yellow, the connective shortly appendaged at the apex, the pollen yellow; pistil 1, equally long as the stamens, 7—8 mm. long; style marcescent, subulate, upwardly narrowed, 5—6 mm. long, 0.4 mm. in diameter, white, stigmas terminal, single, capitulate, minute, white; ovary 3-locular, trigonous-depressed-globose above, emarginate at the apex, 1.6—1.8 mm. long, 2.1—2.2 mm. in diameter, greenish-white; placentae axile; ovules 2 in each locule, ascending.

In the city of Kioto the dormant bulbs germinated in the month of September, the flowers opened up in the month of May.

Japanese common name: wakegi.

Sometimes cultivated on estates in Japan and China; native country unknown.

The type was collected by Y. Araki (no. 16026) on the author's estate in the city of Kioto.

[AMARYLLID GENERA & SPECIES—H. N. Moldenke, continued on page 60.]

REGISTRATION OF NEW AMARYLLID CLONES

Registrar: Mr. W. D. Morton, Jr.

This department has been included since 1934 to provide a place for the registration of names of cultivated *Amaryllis* and other amaryllids. The procedure is in harmony with the INTERNATIONAL CODE OF BOTANICAL NOMENCLATURE (edition publ. 1956) and the INTERNATIONAL CODE OF NOMENCLATURE FOR CULTIVATED PLANTS (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "DESCRIPTIVE CATALOG OF HEMOROCALLIS CLONES, 1893-1948" by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $2.50 prepaid from: Dr. Thos. W. Whitaker, Executive Secy., THE AMERICAN PLANT LIFE SOCIETY, Box 150, La Jolla, Calif. CATALOG of HYBRID NERINE CLONES, 1882-1958, by Emma D. Menninger; and CATALOG OF BRUNSVIGIA CULTIVARS, 1837-1959, by Hamilton P. Traub and L. S. Hannibal published in 1960 Plant Life, with additions to both in the present (1961) edition. In the present issue (1961), the first

edition to THE GENUS X CRINODONNA is published which serves also as a catalog of cultivars. A catalog of Amaryllis names, and also catalogs of the names of other cultivated amaryllids, are scheduled for publication in future issues.

Only registered clones of Amaryllis and other amaryllids are eligible for awards and honors of the AMERICAN AMARYLLIS SOCIETY. Numbers of registered clones are preceded by a prefix, an abbreviation for the genus concerned. Thus, A-390, the "A" standing for *Amaryllis;* Z-1, the "Z" standing for ZEPHYRANTHES, etc.

Correspondence regarding registration of all amaryllids such as *Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis,* and so on, should be addressed to: Mr. W. D. Morton, Jr., Registrar, 3114 State Street Drive, New Orleans 25, Louisiana. The registration fee is $2.00 for each clone to be registered. Make checks payable to AMERICAN PLANT LIFE SOCIETY.

HYBRID AMARYLLIS CLONES

Introduced by R. E. Raasch, 345 Deddridge St., Corpus Christi, Texas:

Amaryllis clone **'Florence Raasch'** (Raasch, 1960); reg. no. A-554, 5-4-60. D-4a (Reginae); scape 24-26" tall; spring blooming, foliage present at flowering; umbel 4-flowered; flower length (sideways) 6—6½"; width 7—7½" across face; flowers held horizontally; beautiful rose red (HCC-724), deeper dark glossy rose-red in throat; veined deeper in color; tepaltube rose red; rapid multiplier.

Introduced by Mrs. John F. Cronin, P. O. Box 207, Lutz, Florida:

Amaryllis clone **'Sensation'** (Cronin, 1960); reg. no. A-652, 8-29-60. An outstanding D-5a (Leopoldii), segs recurved; usually two scapes, 22-24" tall; in spring, deciduous; umbel 4-flowered, florets held slightly upright; flower length 3½"; width 10-11"; flower ground color white, with ½" picotee border of penciled rose madder (HCC-23/1 to 23/2) which appears to be solid rose color from a distance; texture creped. Stigma trifid. Parentage: Mead Strain pink ♀ x 'White Dazzler' ♂. Introduced 8-1-60.

Registered by Leon & Frieda Boshoff-Mostert, Kleinskuur, Balfour, Transvaal, South Africa:

Amaryllis clones Reg. #562, **'Alec'**, brick red with currant red flush and white star; Reg. #563, **'Alpha'**, wide rounded segs of self vermilion; Reg. #564, **'Amazon'**, currant red with speckled segs; forceful appearance; Reg. #565, **'Anagram'**, shades of geranium lake, flushed white; Reg. #566, **'Dawning'**, dawn pink with camellia rose influence, flushed white; beautifully balanced bloom, with heavy seersucker texture; Reg. #567, **'Azalea'**, soft pale azalea pink with white central star; Reg. #568, **'Bethlehem Gem'**, brick red with salmon influence, suffused white, very large and impressive; Reg. #569, **'Brocade'**, porcelain rose; tips flushed azalea pink; Reg. #570, **'Capsicum'**, capsicum red, softly fused with white; very attractive; Reg. #571, **'Cardinal Wolsey'**, deep cardinal red self; Reg. #572, **'Cardinal's Choice'**, clear medium to deep cardinal red; Reg. #573, **'Carolina'**, scarlet and white; Reg. #574, **'Cathedral Peak'**, blood red self; Reg. #575, **'Chartreuse'**, complete chartreuse green with scarlet pencil lines and flushed porcelain rose; Reg. #576, **'Cherry'**, cherry red self; Reg. #577, **'Cherry Bing'**, cherry red self; Reg. #578, **'Cherry Flip'**, deep cherry red; Reg. #579, **'Corpus Christi'**, pure white with unbroken fringe of carmine around all segs; Reg. #580, **'Dawn'**, soft empire rose, flushed on white base; Reg. #581, **'Dawn Rose'**, blend of porcelain rose and white with scarlet pinpoints; Reg.

#582, **'Display'**, vermilion with carmine influence; Reg. #583, **'Dixie'**, scarlet on cream base and apple-green throat; Reg. #584, **'Drakensberg'**, blood red self; Reg. #585, **'Eastern Glory'**, very dark mandarin red with blood red influence; Reg. #586, **'Etna'**, fire red self; clear, dazzling blooms; Reg. #587, **'Feline Repose'**, geranium lake in various shades; Reg. #588, **'Florida'**, shades of scarlet with large white star; Reg. #589, **'Francis Drake'**, geranium lake with scarlet and signal red influence; Reg. #590, **'Gerald Ash'**, light geranium red; Reg. #591, **'Ghent'**, azalea pink; Reg. #592, **'Haarlem'**, clear bright vermilion; Reg. #593, **'Hex River'**, mandarin red; Reg. #594, **'Impertinence'**, white base, strongly veined and brushed with a blend of turkey red and blood red; Reg. #595, **'Invitation'**, white base, softly overlaid with camellia rose; Reg. #596, **'Istanbul'**, turkey red with clear white central star; Reg. #597, **'Jasper'**, jasper red self with an overlay of capsicum red; Reg. #598, **'Jean Van Doesburg'**, beautiful begonia color; Reg. #599, **'Jewel Box'**, shades of salmon, brick red, scarlet and jasper red; Reg. #600, **'Juliana'**, clear bright Dutch vermilion with rose influence; crystalline sheen on white blushing and edges of segs; always a favorite with visitors; Reg. #601, **'Kathleen Dobson'**, snow white with faint broken pencil lines of cardinal red on upper petsegs and setsegs; frilled edges; Reg. #602, **'Kismet'**, white, shaded with carmine veining; Reg. #603, **'Lafayette'**, bright Dutch vermilion with distinct small white central star; Reg. #604, **'Lion's Head'**, very large deep currant red; Reg. #605, **'Maluti'**, large cardinal red self; Reg. #606, **'Mandarin's Joy'**, complete dark mandarin red self; large decorative rounded blooms; Reg. #607, **'Mandarin's Pride'**, clear light red with pleasing soft white throat; Reg. #608, **'Marie Ash'**, bright deep scarlet and white; Reg. #609, **'Melanie'**, scarlet self; Reg. #610, **'Paprika'**, capsicum red self; Reg. #611 **'Picardy'**, large poppy red blooms sprinkled with gold dust; commands attention; Reg. #612, **'Pink Azalea'**, azalea pink; Reg. #613, **'Prins Willem'**, shades of salmon, burnt orange and begonia; Reg. #614, **'Radiance'**, deep scarlet self; dazzling bright blooms; Reg. #615, **'Robespierre'**, large showy white with delft rose blushing; Reg. #616, **'Rose Lace'**, bright rose madder with white central star; Reg. #617, **'Sarong'**, Dutch vermilion self; Reg. #618, **'Scarlet O'Hara'**, very large and heavily veined scarlet with large white star, extending along midribs; Reg. #619, **'Shepherdess'**, delft rose overlaid carmine rose; a real pink; Reg. #620, **'Signal Hill'**, similar to **'Lafayette'**, but of clear signal red; Reg. #621, **'Singapore'**, orient red; Reg. #622, **'Skildwag'**, large exhibition type dark vermilion self; Reg. #623, **'Spring Butterfly'**, seersucker white with edges of scarlet and faint eye-lashes of scarlet on segs; Reg. #624, **'Thaba 'Nchu'**, blood red self. Reg. #625; **'Fortress'**, brick red with white midrib towards throat, one of the largest; Reg. #626, 'Rebel', medium scarlet base, sparingly and attractively flushed white; Reg. #627, **'Schooner'**, azalea pink, flushed white; very large and decorative; Reg. #628, **'Time Signal'**, signal red self; Reg. #629, **'Tzaneen'** mandarin red; #630, **'White Belle'**, pure white with pinpoints of crimson on petsegs; Reg. #631, **'Winks'**, begonia with vermilion influence and white star; Reg. #632; **'Wisley'**, azalea pink; large blooms; Reg. #633, **'Bondi Beach'**, deep shrimp red self; Reg. #634, **'Bridal Bouquet'**, cream with delft rose margins; Reg. #635; **'Cherry Liquor'**, cherry red with red throat; Reg. #636, **'Coral Island'**, azalea pink, blends with coral pink and rhodonite red on a complete uranium green base; cream all around margins; Reg. #637, **'Cream Parfait'**, creamy white with jasper red pencil lines; Reg. #638, **'Currant Wine'**, currant red self; Reg. #639, **'Dagbreek'**, deepest blood red with maroon throat; Reg. #640, **'Dallas Bride'**, white self with seersucker texture; Reg. #641, **'Geranium Lake'**, geranium lake in varying shades; Reg. #642, **'Leone Schweizer'**, pure white with blush carmine rose and claret rose around the margins; Reg. #643, **'Magnolia'**, large white; Reg. #644, **'Malay Star'**, deep rose opal, overlaid with crimson, white central star; Reg. #645, **'Meteor'**, dazzling vermilion with mandarin red influence; Reg. #646, **'New Orleans'**, blend of dawn pink, camellia rose and porcelain rose with begonia segment tips; Reg. #647, **'Pink Reflection'**, blend of camellia rose, crimson and rose opal, suffused on white; Reg. #648, **'Schubert'**, azalea pink; Reg. #649, **'Stained Glass'**, porcelain rose with white overlay on all segs; Reg. #650, **'Pirate'**, bright blood red with white star and white blushing; Reg. #651, **'Willem Coetzer'**, lavish brushing of brick red on chartreuse green; Reg. #666, **'Crown Jewels'**, dark red self.

Introduced by M. Van Waveren & Sons, Hillegom, Holland:—

Amaryllis cl. **'Bon Ton'**; reg. no. A653, scape 20″ tall, umbel 4-flowered, fls. carmine pink.

Amaryllis cl. **'Christmas Dream'**; reg. no. A-654, scape 22″ tall; umbel 3—4-flowered, fls. orange-scarlet self, satin finish in throat, style and stigma orange-colored, fls. 3½″ long (Leopoldii, D-5).

Amaryllis cl. **'Decora'**; reg. no. A-655; scape 20″ tall; umbel 4-flowered, fls. 8″ across face, pure rose with carmine red ribs, and carmine blotch towards the throat.

Amaryllis cl. **'Foster Dulles'**; reg. no. A-656; scape 24″ tall; umbel 4-flowered, fls. deep scarlet, 8″ across face.

Amaryllis cl. **'General Eisenhower'**; reg. no. A-657; scape 21″ tall; umbel 3—4-flowered, fls. with an orchidaceous shade of salmon with darker throat.

Amaryllis cl. **'Haarlem'**; reg. no. 658; scape 21″ tall; umbel 3—4-flowered, fls. Bishop's red with satin dark red throat; 7″ across face.

Amaryllis cl. **'Orange Beauty'**; reg. no. A-659; very flat blooms only 2″ deep (Leopoldii D-5), flowers 7″ across face, orange deepening to at the ribs and in throat.

Amaryllis cl. **'Poussin'**; reg. no. A-660; scape 22″ tall, umbel 3—4-flowered, 2″ in length (Leopoldii D-5), star-shaped, fls. wine red with satin finish, throat crimson with contrasting lime green points.

Amaryllis cl. **'Pure Pink'**; reg. no. A-661; flowers 3″ in length (Leopoldii D-5), 7″ across face, dark pink, shaded violet, with carmine red ribs and throat, tepalseg margins slightly wavy.

Amaryllis cl. **'Rose Beauty'**; reg. no. A-662; umbel 3-flowered, fls. 6½—7″ across face, 2½″ in length (Leopoldii D-5), cyclamen rose with red throat; stamens and style rose color.

Amaryllis cl. **'Rosy Cloud'**; reg. no. A-663; scape 18″ tall, umbel 4-flowered, fls. 6—8″ across face, 3½″ in length (Leopodlii D-5), delicate pearl pink, darker pink ribs, flushed carmine towards center of segs, throat lettuce green and white, stamens and style white.

Amaryllis cl. **'Snow Man'**; reg. no. A-664; flowers 3″ in depth (Leopoldii D-5), snow white with green throat, stamens and style white; **lily fragrance.**

Amaryllis cl. **'Polar Night'**; reg. no. A-665; flowers 3″ deep (Leopoldii D-5), snow white, with green luster, and green throat; stamens and pistil white; 2—3-flowers per umbel; scape 20″ tall; flowers 7″ across face.

Introduced by Ludwig & Company, Hillegom, Holland:

Amaryllis clone **'Symphony'**; reg. #A-557, 1960. D-5a (Leopoldii); Scape 24″—26″ tall; spring (half late) flowering; umbel 4-flowered; flowers round; depth 3½″; 8—8½″ in diam.; flower color Delft rose self, deepening in the throat. This is an improved 'Diamond'.

Amaryllis clone **'White Favorite'**; reg. #A-558, 1960. D-5a (Leopoldii); scape 24″—26″ tall; spring (late(flowering; umbel 4-flowered; flowers round; depth about 3″; 8″ in diam.; flower color outstanding pure white, with somewhat greenish throat, slightly bearded deep in throat.

Amaryllis clone **'Bella Vista'**; reg. #A-555, 1960. D-5a (Leopoldii); scape 22″—22″ tall; spring (half late) flowering; umbel 4-flowered; flowers round, 2¾″ deep; 7—8″ in diam.; flower color bright cherry red (722—722/1) with dark red throat. It is named for the villa of Mrs. C. S. van Til-Zijlstra, proprietor of Ludwig & Co., at Hillegom.

Amaryllis clone **'Flora Queen'**; reg. #A-556, 1960. D-5 (Leopoldii); scape 24″-26″ tall; spring (half late) flowering; umbel 4-flowered; flowers 8″ in diam.; flower color spinel red (0625) with darker veins, especially in the throat.

Amaryllis clone **'Pamela'**; reg. #A-559, 1960. D-4 (Reginae); scape 20″ tall; spring (very early) flowering; umbel 5—6-flowered; flowers 3″ in diam.; flower color capsicum red (715) with uranium green star in throat, stamens and style

lighter red, and very light green towards throat; tepalsegs are pointed, elegantly loose reminiscent of an orchid.

Amaryllis clone **'Pixie'**; reg. #A-560, 1960. D-5 (Leopoldii); scape 20"-22" tall; spring (early) flowering; umbel 5—6-flowered; flowers triangular, 2½" in diam.; flower color orange with lighter toward base (Dutch vermilion, 717), stamens and style bright red, throat somewhat greenish. A very free-flowering "Gracilis" novelty.

Amaryllis clone **'Voodoo'**; reg. #A-561, 1960. D-4 (Reginae); scape 16" tall; spring (early) flowering; umbel 4—6-flowered; flowers 3½" deep; flower color scarlet, striped white in shape of star, throat slightly green; flowers trumpet shaped.

HYBRID BRUNSVIGIA CLONES

Introduced by Mrs. Polly Anderson, 4810 Palm Drive, La Canada, Calif.:—

Brunsvigia x. parkeri (American group) clone **'Full Circle'** (**Anderson, 1961**). Umbel 24-flowered, florets in a full circle, large and open-faced white flowers, with slightly ruffled segs. The apricot color in the throat extends half way up the segs and shows through on the outside; stamens and style apricot colored for half their length; a faint pink blush appears on the fading of the flowers.

Introduced by Hamilton P. Traub, La Jolla, Calif.—

Brunsvigia x parkeri (American group) clone **'Wild Rose'** (Traub, 1961). Early flowering (Aug.-Sept.), umbel 15-flowered, good sized-flowers; the upper 1/4 of the segs colored apple blossom pink, veined deeper pink, large white throat, very light apricot deep in throat; flowers changing to uniform apple blossom pink, veined deeper pink with age. A very charming clone.

AMARYLLID NOTES, 1961

HAMILTON P. TRAUB, *California*

Agapanthus Patens (?)

In JRHS 84: 554-555. 1959, the A. M. was awarded July 21, 1959 to *Agapanthus patents* exhibited by the Hon. L. Palmer. This is believed by him to be the original plant known as *A. mooreanus* and that the many plants now masquerading under this name were probably distributed as seed from the original plant and were variable hybrids; that the true plant has small linear leaves about 1.3 cm. wide and 28 cm. long which are strongly ribbed on the back; scape about 51 cm. tall; umbel is 20—25-flowered; flowers wisteria blue.

Editorial Note.—The above plant may be *Agapanthus africanus* which is sometimes listed as *A. mooreanus*, a synonym.

Amaryllis parodii (Hunz. et Cocu.) Traub, **comb. Nov.**

Amaryllis parodii (Hunz. et Cocu.) Traub, *comb. nov.*, syn.—*Hippeastrum* parodii Hunz. et Cocu., Trab. Mus. Pot., Univ. Nac. Cordoba 2: 1—16, figs. 1—5. 1959.

Brunsvigia rosea pudica (Ker-Gawl.) Hann.

In the writer's *Brunsvigia* garden in 1960, there appeared a scape with a 3-flowered umbel on a small bulb of the Cape Belladonna, *Brunsvigia rosea* (early flowering group). This is similor to *Brunsvigia rosea pudica* (Ker-Gawl.) Hann., Herbertia 10: 64. 1943 [1944]. Thus the problem of placing this plant is solved—Ker-Gawler's plant was apparently depauperate, and as such is not entitled to specific rank. It has to be reduced to *Brunsvigia rosea* (Lam.) Hann., as previous workers have suggested.

In our plant with the 3-flowered umbel, the flowers were light pink, with large white throat, the flower color changing to solid pink with age. The writer has accumulated specimens covering the entire range from the 3-flowered to the 14-flowered umbel.

Traub No. 815 (TRA), 9-11-60, cult. La Jolla, Calif. Umbel 3-flowered.
Traub No. 839 (TRA), 7-27-58, cult. La Jolla, Calif. Umbel 4-flowered.
Traub No. 813 (TRA), 9-11-60, cult. La Jolla, Calif. Umbel 5-flowered.
Traub No. 814 (TRA), 9-11-60, cult. La Jolla, Calif. Umbel 9-flowered.
Traub No. 812 (TRA), 8-30-60, cult. La Jolla, Calif. Umbel 10-flowered.
Traub No. 811 (TRA), 8-30-60, cult. La Jolla, Calif. Umbel 14-flowered.

Plants with umbels up to 18-flowered have been observed, but no specimens have been preserved in such cases up to the present.

Rhodophiala x huntiana Traub, hybr. nov.

Planta inter R. bifidam vel R. spathaceam hybrida; spatha monophylla [solum in lato unico usque ad basem incisal vel bifida; floribus intense rubris usque ad rhodamino-rubellis. Holotypus: Traub no. 817 a+b (TRA) culto La Jolla, California, 12 Septembri 1960.

This hybrid has been named in honor of Mr. William Lanier Hunt, the well-known landscape architect and plantsman of North Carolina who has cherished Rhodophialas in his garden.

Rhodophiala spathacea (Herb.) Traub, **comb. nov.**

Rhodophiala spathacea (Herb.) Traub, *comb. nov.* Syn.—*Habranthus spathaceus* Herb., in Bot. Mag. Lond. 52: sub pl. 2597. 1825.

Amaryllis x mostertii Traub, **hybr. nov.** (Amaryllidac.)

Planta inter 'A. belladonna L.' et species ignotas alias unam vel duas hybrida, in Africa australe elapsa; flore figuro 'A. belladonna L.' plusminusve simile; paraperigonio prominente setis usque ad 2 mm. longis et cum circulo rubro vel ionthis rubris intus in base segmentorum tepalorum ornato; limbo intense flavido-rubello (NCF 5R-6/11) insto 'Begonia' (HCC-619) usque ad lateritio, jugulo albi-asteriscato, ionthis viridi-albidis conjugato, supra irregulariter marginato; stigma distincte 3-lobato, lobis 1 mm. longis. Holotypus: Traub no. 822 (TRA), 10-9-60.

HOLOTYPE: Traub *No.* 822 (TRA), 10-9-60, grown from bulb obtained from Balfour, Transvaal, Union of South Africa.

This is apparently a cross between *Amaryllis belladonna* L. and a species of the subgenus Omphalissa (as shown by the red ring at the base of the throat in the hybrid), plus *A. reginae* (as shown by the white star in the throat); otherwise it somewhat resembles *A. belladonna* L. This hybrid is reported as naturalized in South Africa. A similar hybrid is reported as naturalized in Sikkim, India—Specimen: Traub *No. 780a+b* (TRA), 5-26-60, grown from bulbs imported from India by Mr. Robert D. Goedert.

A similar plant is represented by the specimen, A. W. Excell *No.* 557 (BM), Principe Island, W. C. Africa, Terreiro Velho, alt. ca. 700 (=218.4 m.), 11. xii. 1932, collected on a plantation. The flower is indicated as scarlet with green stripes down the center towards the base of each tepalseg. It is similar to the India and S. Afr. plants.

Thus, this type of hybrid was apparently distributed by the European colonial officials and their families, and settlers, in various parts of India and Africa some time in the 19th century.

The hybrid is named in honor of Mr. Leon Boshoff-Mostert, the outstanding *Amaryllis* breeder of Balfour, Transvaal, Union of South Africa, who kindly sent us the bulbs that produced the flowers and leaves for the holotype specimen.

Brunsvigia x parkeri W. Watson ex Traub, **hybr. nov.** (Amaryllidac.)

Amaryllis x *parkeri* W. Watson, Gard. Chron. Feb. 6, 1909, p. 92; X *Brunsdonna parkeri* (W. Watson) Worsley, in Jour. RHS *51:* 65-69. 1926; *Brunsvigia* x *parkeri* W. Watson ex Traub, in Plant Life *5:* 134, 1949; *16:* 59. 1960, *anglice*.

Plantae inter B. roseam et B. grandifloram atque B. josephinae hybridae; bulbo ovoideo vel globoso; foliis loratis, cum (in holotypo) vagina folii basali tubulari vel hac vagina desiderata; scapo solido; spatha 2-valvata; umbella usque ad 22-flora; floribus pedicellatis, fuchsino-rubellis (in holotypo) vel albis vel rubellis vel subpurpureis fragrantibus; tubo tepalorum 1.3 cm. longo (in holotypo) vel breviore vel paulo longiore; segmentis tepalorum 10 cm. longis (in holotypo) vel brevioribus vel longioribus; staminibus quam segmentis tepalorum quadrante brevioribus; stylo quam segmentis tepalorum paulo breviore; stigma minute 3-lobato. Holotypus: No. 823 a+b, 10-15-60.

HOLOTYPE: No. 823a+b (TRA), Jack Scavia, 10-15-60; cult. Lakeside, Calif.: grown from bulb obtained from Constable, Ltd., London, some years ago as *Brunsvigia* x *kewensis* Hort.

Brunsvigia x tubergenii Traub, **hybr. nov.** (Amaryllidac.)

"Amaryllis x spofforthiae Herb" in Amaryll. 278-279; 422; 425. 1837, invalidly published name, *(Brunsvigia josephinae* ♀ x *B. rosea* var. *blanda* ♂); *Brunsvigia josephinae* ♀ x *B. rosea* ♂, C. G. Van Tubergen, Jr., Gard. Chron. Lond. Jan. 23, with fig. in suppl. 1909; X *Brunsdonna tubergenii* Hort., Haggag, Hort. Rev. Egypt. No. 39, p. 5, with fig. 1918; Messrs. Van Tubergen, in New Bulbous Plants, pp. 52-53. 1947; X *Brunsdonna parkeri* var. *tubergenii* Hort., Worsley, in Jour. RHS *51:* 66-67. 1926; *Brunsvigia* x *tubergenii* Hort., in Plant Life *16:* 61. 1960, *anglice*.

Plantae inter "B. josephinae Ker" et "B. rosea" hybridae; bulbo ovoideo; folis loratis e bulbo directe productis; scapo solido; umbella usque ad 22-flora; floribus pedicellatis intense rubellis fragrantibus; tubo tepalorum 1.1 cm. longo; segmentis tepalorum 7.7—8 cm. longis, 2.2—2.5 cm. latis lanceolatis acutis; staminibus quam segmentis tepalorum quadrante brevioribus; stylo quam segmentis tepalorum paulo breviore; stigma minute 3-lobato. Holotypus: Traub no. 810 a+b, 8-27-60.

HOLOTYPE: Traub No. 810a+b (TRA), 8-27-60, cult. La Jolla, Calif.; grown from bulb received some years ago by Jack Scavia from Van Tubergen & Co., Haarlem, Holland as X *Brunsdonna tubergenii*, and later presented by Mr. Scavia to Hamilton P. Traub.

Tribe *Pancratieae* (Pax) Traub, *comb. nov.* (Amaryllidac.) Syn.-Subtribe *Pancratiinae* Pax, in Engl. & Prantl, Nat. Pflanzenfam. II(5): 112-113. 1887, in part.

Tribe *Eucharinae* (Pax) Traub, *comb. nov.* (Amaryllidac.) Syn.-Subtribe *Eucharinae* Pax, in Engl. & Prantl, Nat. Pflanzenfam. II(5): 110-111. 1887, err. *Eucharidinae;* Pax & Hoffmann, l. c. 2nd. ed. 15a: 411-413. 1930, in part.

Tribe *Eustephieae* (Pax) Traub *comb. nov.* (Amaryllidac.) Syn.-Subtribe *Eustephinae* Pax, in Engl. & Prantl, Nat. Pflanzenfam. II(5): 113-114. 1887; Pax & Hoffmann, l. c. 2nd ed. 15a: 413-415. 1930.

Tribe *Ixiolirieae* (Pax) Traub, *comb. nov.* (Amaryllidac.) Syn.-Subtribe *Ixioliriinae* Pax. in Engl. & Prantl, Nat. Pflanzenfam. II(5): 109-110. 1887; l. c. 2nd ed. 15a: 410. 1930.

Tribe *Zephyrantheae* (Pax) Traub, *comb. nov.* (Amaryllidac.) Syn.-Subtribe *Zephyranthinae* Pax, in Engl. & Prantl, Nat. Pflanzenfam. II(5): 106-108. 1887; Pax & Hoffmann, l. c. 2nd ed. 15a: 406-407. 1930.

Tribe *Crineae* (Pax) Traub, *comb. nov.* (Amaryllidac.) Syn.-Subtribe *Crininae* Pax, in Engl. & Prantl, Nat. Pflanzenfam. II(5): 108-109; Pax & Hoffman, l. c. 2nd ed. 15a: 408-410. 1930.

Tribe *Haemantheae* (Pax) Traub, *comb. nov.* (Amaryllidac.) Syn.-Subtribe *Haemanthinae* Pax, in Engl. & Prantl, Nat. Pflanzenfam. II(5): 103-105. 1887; Pax & Hoffmann, l. c. 2nd ed. 15a: 401-403. 1930.

Subtribe *Milulinae* (Prain) Traub, *comb. nov.* (Tribe Allieae: Amaryllidac.) Syn.-Tribe *Miluleae* Prain, in Sci. Mem. Med. offic. Army India 9: 25. 1896; Engl. in Engl. & Prantl, Nat. Pflanzenfam. 2nd ed. 15a: 329. 1930.

Tribe *Amarylleae* Endlicher, in Genera Plantarum, pp. 174-175. 1837. (Amaryllidac.) Lectotype: *Amaryllis* L. (syn.- *Hippeastrum* Herb.)

Agapanthus campanulatus albus

This form was exhibited by W. E. Th. Ingwerson at a RHS show in 1960. (Jour. RHS, Dec. 1960, page 526.)

GALANTHIMINE—Continued from page 46.

According to reports in 1960, U. S. Government scientists, following up the report by Russian scientists, have found that galanthamine hydrobromide has been found ineffective in relieving some neuro muscular disorders, but additional studies have shown that several related drugs from *Narcissus* and *Lycoris* bulbs, all derivatives of lycoramine, appear promising.

[AMARYLLID GENERA & SPECIES, H. N. Moldenke, continued from page 60.]

Amaryllis parodii (Hunz. et Cocu.) Traub, in Plant Life 17: 1961; syn.-Hippeastrum parodii Hunz. et Cocu., in Traub. Mus. Bot., Univ. Nac. Cordoba, 2 (no. 7): 1—16. 1959. Macropodastrum; bulb 7.5—8 cm. in diameter, about 11 cm. high, the neck about 5 cm. long and about 3.6 cm. in diameter, the tunics fuscous (brown); leaves green, glaucescent pruinose, 35—55 cm. long and 4.8—6.5 cm. wide during the flowering of the bulb; scape green, pruinose, 43—65 cm. long; spathe about 6.3 cm. long; flowers 5 or 6, not odorous; pedicels 4—6 cm. long, about 0.5 cm. in diameter; perianth 16—16.5 cm. long, the tube greenish or yellowish-green, 8—9.5 cm. long, the segments greenish-yellow or yellow; the sepals mucronate, 6.7—7 cm. long, 2.1—2.4 cm. wide; the petals rounded at the apex, 6.5—8 cm. long, 1.5—2.2 cm. wide; corona inconspicuous, with very minute fringes 0.5—1.5 mm. long; filaments unequal, 5.3—6.6 cm. long; pollen-grains 1-sulcate, large, about 67.5—72.5 μ in diameter in longitudinal section, about 55—60 μ in diameter in transverse section; ovary mostly slightly arcuate, obtusely triangular-prismatic, about 1.2 cm. long, 0.6—0.7 cm. wide; stigma capitate, 3-lobed, longer than high; chromosome number: 2n=22.

Along the edge of Route no. 9 between Villa de Maria and the boundary of Santiago del Estero, at Serranias de San Miguel, at about 600 meters altitude, in the Department of Río Seco, Province of Córdoba, Argentina, November 26, 1958, Hunziker, Cocucci, & Caro 13775; vernacular name: "Azucena del compo." Holotype deposited in the museum at Córdoba.

Fig. 10. *Sternbergia lutea*, as grown by S. Y. Caldwell, Nashville, Tennessee. Photo by S. Y. Caldwell

REVISION OF STERNBERGIA

Prof. Naomi Feinbrun (of The Hebrew University, Jerusalem) and W. T. Stearns (of The British Museum—Natural History, London), have published a revision of the genus *Sternbergia* in Palestine (Bull. Res. Council, Israel, Vol. 6D: 167—173. 1958). They have provided a key to all of the species.

Sternbergia is a small genus with four or five yellow-flowered species distributed in central and eastern Europe, Transcaucasia, Asia Minor to Northern Iran. The species listed are *S. clusiana*, *S. colchiciflora*, *S. pulchella*, *S. lutea*, and *S. fischeriana*. Of these, *S. fischeriana*, and *S. pulchella* (probably a synonym of *S. colchiciflora)* are not listed as native to Palestine.

The authors are to be congratulated for this important contribution toward an understanding of the genus *Sternbergia*.

At the present time, only *S. lutea* (Fig. 10) and *S. fischeriana* (obtainable from Van Tubergen) are known to be definitely cultivated in the United States. It is hoped that *S. clusiana* and *S. colchiciflora* can be brought into the United States in the near future.

Although all of the species are yellow-flowered, some of them make a brilliant showing—*S. lutea*, in the fall, and *S. fischeriana*, in the spring. In the case of *S. clusiana* and *S. colchiciflora*, the scape does not reach above the bulb-neck, but the tepalsegs in *S. clusiana* are 3.5—7 cm. long, and 1—3.5 cm. wide. Thus there is the possibility of hybridizing with other species to obtain larger flowers with the habit of *S. lutea*.

Fernandes (Plant Life 8: 66. 1952) concluded that "the data from cytology are not in accord with the idea of considering the genus *Lapiedra* Lag. close to Sternbergia [as indicated by Herbert, Amaryll. 1837] from the systematic point of view."

The present writer (undersigned) originally placed *Sternbergia* in the Tribe Zephyrantheae, but after a detailed morphological study of *S. Lutea* and *S. fischeriana*, concluded that this genus belongs to the Tribe Narcisseae along with the genera *Narcissus* and *Tapeinanthus*. It is true that the paraperigone (corona) is lacking, but one has but to look at the plant habit and the capsule (fruit), in *Sternbergia fischeriana* for instance, which resemble those of *Narcissus*. In *Tapeinanthus* the paraperigone (corona) is rudimentary; in *Sternbergia* it is lacking. Dr. Flory and his associates are now making a chromosome study in an attempt to test the hypothesis.—*Hamilton P. Traub*

SENDING AMARYLLID FLOWERS BY MAIL

Hamilton P. Traub, *California*

The writer often receives amaryllid scapes with open flowers for identification. In many cases these are packed in somewhat moist sphagnum moss or newspapers. When received, such specimens are usually in a state of decay, and are worthless for identification purposes.

This note is written in the hope that those sending specimens in the future will follow the directions given below which make it possible to transport flowering scapes of amaryllids in excellent condition.

The first principle to recognize is that amaryllid scapes do not need added moisture during the transportation period, unless it is prolonged. If possible, the scape should be cut after the first flower or flowers have opened. However, they may be sent in the later stages of development. Any buds on the scape will open naturally after arrival when the scape is placed in water.

A pasteboard box long enough to accommodate the scape should be used; the type of container used by florists will serve best, but other types may also be used. The bottom of the box should be filled with loose newspapers or tissue paper. The scape is then placed on top of the loose paper, and is securely fastened to the bottom of the box *by means of string* sewed to the pasteboard; usually it is fastened in one place only, but sometimes it is secured in two places in the lower half of the scape. Some fasten the scape with Scotch tape. More loose paper or tissue is then placed on top of the scape, and the cover is replaced. The package is wrapped, if necessary, and tied for shipment by air mail if the distance to be shipped warrants it. If desired, small openings for ventilation may be provided.

All types of amaryllis may be sent in this manner, including *Amaryllis, Brunsvigia, Crinum, Hymenocallis*, etc., etc. On arrival, the scape or scapes are placed in water, and the buds will expand normally. If leaves are present on the original plant, it is desirable to send along also at least one leaf so that when the herbarium specimen is prepared, this essential part is also present on the finished sheet.

[AMARYLLID GENERA & SPECIES, H. N. Moldenke, continued from page 50.]

X Crinodonna traubii Moldenke, **hybr. nov.** (Amaryllidac.)

Plantae inter "Brunsvigia x parkeri W. Wats. ex Traub" et "Crinum moorei Hook. f." hybridae; bulbo cum collo genuino et vagina folii basali tubuloso ornato; foliis loratis canaliculatis plusminusve radiale dispositis; umbella 10—14-floris; floribus pedicellatis albis vel rubellis usque ad subpurpureis; tubo tepalorum curvato, quam segmentis tepalorum dimidio breviore; staminibus fasciculatis quam segmentis tepalorum ca. quadrante brevioribus; antheris versatilibus; stylo quam segmentis tepalorum paulo breviore; stigma minute trifido. Holotypus: Traub no. 809a+b (TRA), clone "Alma Moldenke", culto La Jolla, California, 25 Augusti 1960.

[AMARYLLID GENERA & SPECIES, H. N. Moldenke, continued on page 57.]

CATALOG OF NERINE CULTIVARS 1882–1960

By

EMMA D. MENNINGER

FIRST EDITION

THE AMERICAN PLANT LIFE SOCIETY

Box 150, La Jolla, California

1961

ADDITIONS—CATALOG OF NERINE CULTIVARS—TO AUG. 20, 1960

By **Emma D. Menninger,** Greenoaks, Arcadia, California

[A continuation of **CATALOG OF NERINE HYBRID CLONES,** 1882—Dec. 31, 1958, published in **PLANT LIFE** 16: 63—74. 1960.]

The compiler wishes to thank the following named persons for information supplied by them: Mr. L. S. Hannibal, Fairoaks, Calif.; Mr. Jac. Hage, General Secretary, Royal Netherlands Society for Horticulture and Botany, Aalsmeer, Netherlands; and Mr. H. J. Voors, General Secretary, Royal Dutch Bulb Growers' Society of Haarlem, Netherlands.

ADDITIONS TO ABBREVIATIONS

ABBREVIATION	HYBRIDIZERS, GROWERS, SUPPLIERS AND EXHIBITORS
Cl	Sir Ralph Clarke, Borde Hill, Haywards Heath, Sussex, England. See 1960 list.
deG	Goede, Simon de. Elst, Netherlands. Grower and exhibitor.
Er	Errey, Gilbert. Box 1, Lilydale, Victoria, Australia. Hybridizer.
Ha	Hannibal, L. S. Fair Oaks, California. Grower.
Lo	Lothian, T. N. Director Botanical Gardens. Adelaide, South Australia. Hybridizer.
S	Sir Frederick Stern, Goring-by-Sea, Sussex, England.
Tr	Traub, Dr. Hamilton P., 5804 Camino de la Costa, La Jolla, Calif. Hybridizer and grower.
Va	Van Tubergen, C. G. Haarlem, Netherlands. Hybridizer, Grower, Supplier and Exhibitor.

ABBREVIATION	AWARDS
AMR	Award of Merit. Royal Dutch Bulb Growers' Society. Haarlem, Netherlands.
FCCR	First Class Certificate. Royal Dutch Bulb Growers' Society. Haarlem, Netherlands.
GV	Certificate of Merit. Institute—Vaste Keurings Commissie. Aalsmeer, Netherlands.
GI	Certificate First Class. Institute—Vaste Keurings Commissie. Aalsmeer, Netherlands.
PC	Preliminary Certificate, Royal Horticultural Society, London.

ADDITIONS—NERINE CULTIVARS, THROUGH AUG. 20, 1960

'Arthur Turner'; grower—Cl; awards—AM, Cl, 1959; **N. sarniensis** x **'Wyatt',** HCC 717/1 Dutch vermilion.

'Baby Pink'; grower—deG; awards—GV, deG, 1958; rose pink, camellia rose nerve.

'Borde Hill'; grower—Cl; awards—PC, Cl, 1959, no description.

"Capetown", misspelling for **'Cape Town'.**

'Cape Town'; grower—deG; awards—FCCR, deG, 1957; GI, deG, 1958; rhodamine pink; **N. bowdenii** hybrid, but narrower tepalsegs, HCC 527/2, darker stripes.

'Cranfield'; grower—S; selected for trial at Wisley, 1958, no description.

'Lady Drent'; grower—deG; awards—GV, deG, 1958; porcelain rose.

"Mrs. Barkeley", believed to be a misspelling for **'Mrs. Berkeley',** which see in 1960 list.

'Mrs. Brook'; grower—deG; awards—GV, deG, 1958; mandarin red.

'Pink Frills'; hybridizer—Va; awards—AMR, Va, 1951; GV, Va, 1951; clear pink **N. bowdenii** hybrid, much larger than **N. bowdenii.**

"Pink Trills"; believed to be a typographical error for **'Pink Frills'.**

'Pink Triumph'; grower—V & Tr; listed in 1960 catalog; included in Dutch lists as **N. bowdenii** hybrid imported from Guernsey by Mr. Simon de Goede of Elst, Netherlands, and as having received awards in the Netherlands.

"Pink Triumphant"; believed to be a misspelling for **'Pink Triumph',** which see.

'Rose Camellia'; grower—Ha.

'Rose Tendre'; grower—deG; awards—GV, deG, 1958; neyron rose.

"Samon River"; believed to be a misspelling for **'Salmon River',** which see.

'Salmon River' grower—deG; awards—GV, deG, 1958; camellia rose, shaded China rose.

'San Francisco'; grower—deG; awards—GV, deG, 1958; Turkey red.

'Snowy Dawn'; grower—Ha; "pale pink covered with white ice". Good.

'Walter Fleming'; grower—Cl; awards—PC, Cl, 1959; no description.

'Wyatt'; parent of **'Arthur Turner'.**

CATALOG OF
BRUNSVIGIA CULTIVARS
1837–1960

BY
HAMILTON P. TRAUB
&
L. S. HANNIBAL

FIRST EDITION

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California
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CORRIGENDA

CATALOG OF **BRUNSVIGIA** CULTIVARS

Plant Life 16: 39—62. 1960

Page 44, and thereafter, wherever "John Crane Bidwell", "J. C. Bidwell" or "Bidwell" appear, change "Bidwell" to "Bidwill".

Page 45, 15th line from top, change "Hiester" to "Heister".

Page 57, 17th line from bottom, add "X Brunsdonna Hort., Worsley, in JHRS 51: 66. 1926."

Page 59, Delete 25th line, from top, and insert—"**Brunsvigia x parkeri** Zwanenburg group. Syn.—Amaryllis belladonna parkeri".

ADDITIONS—CATALOG OF **BRUNSVIGIA** CULTIVARS, 1837—1960

'Apple Blossom' (Hannibal, 1960), PL **16:** 78. 1960. Pale pink picotee.

'Cynthia Pike' (Pike, 1960), in Gar. Chron. 148; 469. with fig. 1960. Cross of **Brunsvigia rosea** x. **B.** x **parkeri** W. Wats. ex Traub (Kew form). Umbel 8—10-fld; fls. white suffused rosy-purple, apricot deep in throat. Originated by A. V. Pike.

Brunsvigia x **parkeri** W. Watson ex Traub, in Plant Life, Vol. **17.** 1961. Syn.—**Amaryllis** x **parkeri** W. Watson, in Gard. Chron. Feb. 9, 1909, page 92, without description; **Brunsvigia** x **parkeri** (W. Watson) Traub, in Plant Life **5:** 134. 1949; Plant Life **16:** 58. 1960, anglice. See clone **'Lady Parker'**, type below.

Brunsvigia x **tubergenii** Traub, in Plant Life, vol. **17.** 1961. Syn.—"Amaryllis x spofforthiae Herb.", in Amaryll. 278-279; 422; 425. 1837, invalidly published name; Brunsvigia josephinae ♀ x B. rosea ("Amaryllis belladonna Herb.", non Linn.) ♂, C. G. Van Tubergen, Jr., in Gard. Chron. Jan. 23, 1909, with fig. in sppl.; X Brunsdonna tubergenii Hort. Haggag, in Hort. Rev. Egypt, no. 39, page 5, with fig. 1918; Messrs. Van Tubergen, in New Bulbous Plants, pp. 52-53. 1947; X Brunsdonna parkeri var. tubergenii Hort., Worsley, in Jour. Roy. Hort. Soc. **51:** 66-67. 1926; Brunsvigia x tubergenii Hort., in Plant Life **16:** 61. 1960, anglice.

Brunsvigia x baptistii Hort. (=**Brunsvigia** x **parkeri** (Australian group) **baptistii**); umbel radial, flowers white; see Geo. Kerslake, in Practical Experiments in Cross Fertilization, N. S. W. 3rd Int. Conf. Genet. 1906, London. pp. 396-400 (see page 397).

"Felicea" (Bidwill, 1848 or 1849). The Librarians at the Mitchell Library, Sydney, Australia, have found a memorandum of 1848 or 1849 among the John C. Bidwill papers, in which he requested that one of his **Brunsvigia** hybrid clones, named by Mrs. Macarthur, be given to the bearer of the note. Due to the deterioration of the writing, there is uncertainty about the first letter (probably "F") of the name of the hybrid, which is here indicated as 'Felicia'. Historically, this is of importance since it shows an interest by the Macarthurs in Bidwill's breeding activities, who had perhaps more than one named hybrid **Brunsvigia** clone at that early date.

'Lady Parker', Hannibal, in Herbetia 10: 66. 1943 (1944). Type of **Amaryllis** x **parkeri** W. Watson, Gard. Chron. Feb. 6, 1909, p. 92; X Brunsdonna parkeri (W. Watson) Worsley, in Jour. RHS 51: 65-69. 1926; **Brunsvigia** x. **parkeri** W. Watson ex Traub, in Plant Life 5: 134. 1949; 16: 59. 1960; vol. 17. 1961.

'Radiata Queen', see **'Ramogrande'.**

'Ramogrande' (Hannibal, 1960), Plant Life, vol. **17.** 1961. Syn.—'Radiata Queen' (Hannibal, 1960), in Plant Life **16:** 77. 1960.

'Wild Rose' (Traub, 1961) in Plant Life, vol. **17.** 1961; flowers apple blossom pink.

The Genus X Crinodonna
1921 – 1960

Catalog of X Crinodonna Cultivars

By
Hamilton P. Traub

FIRST EDITION

THE AMERICAN PLANT LIFE SOCIETY
BOX 150, LA JOLLA, CALIFORNIA
1961

THE GENUS X CRINODONNA

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Dr. Attilio Ragionieri, noted for his professional writings in the field of medicine, died at Firenze (Florence), Italy, Oct. 11, 1933. He carried on plant breeding as an avocation. His chief originations consisted of improved freesias, ranunculi, callas, hybrid amaryllids, lily-of-the-valley and various fruits. One of his outstanding originations we know today as the type of X *Crinodonna corsii*, a hybrid between *Brunsvigia rosea* (the CAPE BELLADONNA) ♀ and *Crinum moorei* ♂, which he reported in Gardeners' Chronicle, with figure, Jan. 15, 1921 (see also Yearbook American Amaryllis Society (Herbertia) 1: 64. 1934). This marks the beginning of the recorded history of the bi-generic genus X *Crinodonna* which is important in the horticulture of the United States and other parts of the world today.

The present review serves as the starting point of the nomenclature of X *Crinodonna*. It serves also as a catalog of cultivars since all of these hybrids were made under cultivation, and are maintained as ornamental plants. This is an opportune time to emphasize the desirability of registering all new X *Crinodonna* names in accordance with the registration service maintained since 1934 by the AMERICAN AMARYLLIS SOCIETY which is affiliated with the AMERICAN PLANT LIFE SOCIETY. This will avoid duplication, mispelling, and misapplication of names in the future.

HISTORICAL REVIEW

Dr. Ragionieri in 1921 named his hybrid, *Crinodonna memoria corsii*, stating—"I have dedicated this new hybrid to the venerated memory of the late Marquis Bardo Corsi Salvati, of Florence (Firenze), the enthusiastic and very intelligent lover of fine plants, who had formed in his garden at Sesto the most complete collection of stove and other plants in Italy."

The name chosen by Dr. Ragionieri for the type of the genus was not strictly in accordance with the Botanical Code which insists on binomial epithets. Accordingly, Stapf (Bot. Mag. Lond. Plate 9162. 1929) made the necessary corrections, and thus the name became X *Crinodonna* corsii. This first hybrid, on the clonal level, is properly known as X *Crinodonna corsii* clone 'Dr. Ragionieri'. Unfortunately, the hybrid made by Dr. Ragionieri in Italy is not available in the United States. It is most likely preserved in gardens there and it is hoped that our Italian friends will exchange offsets of it for different X Crinodonnas produced in the United States.

Fred H. Howard (1873—1948), of Montebello, California, independently made the same cross recorded by Dr. Ragionieri. Howard's cross was first reported by J. Coutts, in Gardeners' Chronicle, London, LXXVIII: 411, fig. 171. 1925.

Through the efficient research of Marion B. Crowell, on the Library staff of the Massachusetts Horticultural Society, Boston, Mass., the early

history of X *Crinodonna corsii* clone 'Fred Howard' (syn.-*Amarcrinum howardii* Hort.) has been traced. Under date of Sept. 21, 1926, the Royal Horticultural Society of London, England awarded a First Class Certificate to this clone. The flowers are described as "pale blush rose, becoming rather deeper at the tips." Later in the same year "it was awarded the major prize, the Cory Cup, as the most important novelty certificated during the entire year," by the Royal Horticultural Society, London. In Howard & Smith's Spring and Summer Catalog, Season 1928, Los Angeles, Calif., page 32, it is referred to as a cross of *Crinum moorei* (♂) on the Cape Belladonna, *Brunsvigia rosea* (♀). "The value of this new plant lies in its usefulness as a bulbous plant for growing in pots or for planting in the open garden. Its beautiful soft pink color . . . combined with the lasting character of its flowers, place it in a class by itself. In 1929, Dr. Stapf of Kew, figured X *Crinodonna corsii* [the clone 'Fred Howard'] in the Botanical Magazine, London, Plate 9162.

Alonzo C. Delkin, of Arcadia, Calif., obtained a X *Crinodonna* clone from Mr. Tom Shimoda, of Monrovia, Calif. in 1943, who had collected it in a field in the City of Los Angeles many years ago before the population exploded to its present extensive proportions. The clone has been appropriately named 'Lon Delkin' in honor of Mr. Delkin, an outstanding amateur horticulturist and amaryllidarian (see Plant Life *10:* 49. 1954). This clone is important since it indicates that apparently the bigeneric cross had been made at least once before either Dr. Ragionieri or Fred H. Howard made a similar cross.

L. S. Hannibal, of Fairoaks, Calif., began breeding X Crinodonnas in 1941. His earlier work (Hannibal, 1943), showed success in using *Brunsvigia rosea* var. *minor* as the seed parent and *Crinum moorei* as the pollen parent. In 1952, he introduced the clone 'Dorothy Hannibal' (Hannibal, 1952), which is widely grown. More recently, he has also used *Brunsvigia* x *parkeri* as the seed parent. Up to the present he has produced over 200 seedlings.

Mrs. Polly Anderson, of La Canada, Calif., began X *Crinodonna* breeding in 1948, and at the end of ten years has accumulated over 28 seedlings (Anderson, 1959; 1961). She has utilized both *Brunsvigia rosea* and *B.* x *parkeri* as seed parents, making crosses with *Crinum moorei*, and the hybrid clone 'Ellen Bosanquet'.

Hamilton P. Traub, of La Jolla, Calif., began making X *Crinodonna* crosses in 1956, and up to 1959 had 82 evergreen seedlings in his experimental garden. He has used *Brunsvigia rosea* and *B.* x *parkeri* as seed parents, and tall, medium and dwarf statured forms of *Crinum moorei* as pollen parents. He is also experimenting in the use of the hybrid *Crinum* clones 'Cecil Houdyshel', 'Ellen Bosanquet' and 'Elizabeth Traub' and *Crinum americanum* and *C. bulbispermum*, as pollen parents (Traub, 1961).

The cross, *Brunsvigia* x *parkeri* clone 'Hathor' ♀ x *Crinum moorei roseum* ♂, represents a new kind of X *Crinodonna*, which Dr. Moldenke has named X *Crinodonna traubii*, with the clone 'Alma Moldenke', with rhodamine pink flowers, as the type (Moldenke, 1961).

Dr. Joseph C. Smith, of La Mesa, Calif., and possibly others, are also breeding X Crinodonnas, but up to the present they have not made any progress reports. It is hoped that they will avail themselves of these columns to write about their experiences in the future.

EXPERIMENTAL TAXONOMY

The historical review shows that the bigeneric hybrids are a distinct cultural asset, but the purpose of the present report is concerned mainly with experimental taxonomy. It is rarely that such excellent material is available for systematic study. But the work has only been started since there are a great many possible hybrid combinations between the many species of *Crinum* and *Brunsvigia.* Extensive trials with such material will bring to light various relationships between the species of these genera.

Genus X CRINODONNA Ragionieri ex Traub, **hybr. gen. nov.**

X *Crinodonna* Ragionieri in Gard. Chron. Lond. p. 32 (Jan. 15). 1921 (err. *Crindonna);* Stapf, in Bot. Mag. Lond. *153:* sub plate 9162. 1927 (1929); Bull. Missouri Bot. Gard. *21:* sub plate 6. 1933; Yearbook Amer. Amaryllis Soc. (Herbertia), *1:* 64. 1934.

Syn.—X *Amarcrinum* J. Coutts, in Gard. Chron. Lond. Ser. 3, *LXXVIII:* 411, fig. 171. 1925.

Plantae inter Brunsvigiam et Crinum hybridae; bulbo ovoideo vel globoso tunicato; collo tunicato et interdum eitam vagina folii tubulosa basali ornato; foliis usque ad ordinem distichum vel radiatum inclinatis; floribus albis vel rubellis usque ad purpureis—ceterum descriptionem originalem generis hybridi bignerici persimilibus.

TYPE: X *Crinodonna corsii* Ragionieri ex Traub.

Diagnosis.—Plant evergreen, vegetating chiefly at the end of summer; rootstock an ovoid or globular tunicated bulb with neck, and sometimes in addition, a tubular basal leaf-sheath above the neck; leaves strap-shaped; more or less distichously, or sometimes more or less radially arranged; scape solid; spathe 2-valved; umbel 8—17- or more-flowered; flowers pedicellate, white, pink or purple; ovary oblong, ovules about 6 per locule; tepaltube 2.7—4.2 cm. long; limb of 6 tepalsegs. bilaterally symmetrical; stamens and style fasciculate-declinate-ascending; anthers finally crescent-shaped; stigma minutely trifid.

Hybrids are Sterile.—The bi-generic hybrids between *Brunsvigia* and *Crinum* obtained so far are sterile. This supports the thesis that these two groups are in fact biologic genera, both on the basis of morphological differences (distichous vs. radial arrangement of leaves) that form a decided gap, and the isolating mechanism that results in sexual sterility in the hybrids. Although there are many other combinations of parents that have not been used in crossing experiments so far, the possibility that any of these should turn out to produce fertile hybrids does not appear very promising due to the decided gap between the two genera.

Possible Fertility by Polyploidy.—There still remains one possible avenue towards fertility and that is through polyploidizing the hybrids. The basic chromosome number in *Brunsvigia* and Crinum is $x=11$, and all *Brunsvigia* species so far investigated have $2n=22$

chromosomes (Gouws, 1949; Traub & Moldenke, 1949; Traub, 1958). In Crinum the same is true, except that one polyploid is known, *Crinum gouwsii* Traub, 2n= c. 72 (Gouws, 1949). This polyploid is fertile when siblings are crossed. Thus there is the possibility that if the 2n=44, or tetraploids of X *Crinodonna* clones can be obtained, these might be intra-fertile.

The colchicine technique has been successful in polyploidizing such distant relatives as *Hemerocallis* and *Allium* (Traub, 1951), and experiments are now under way with X *Crinodonna* clones. The question arises that if such fertile bi-generic hybrids are produced, the outlook on such hybrids should be altered sufficiently so that the multiplication sign (X) before the generic name can be eliminated. This multiplication sign before the name is a very great nuisance to everyone concerned (including the editor, printer and the gardener), and such emancipation would be welcome.

Crosses Reported.—Of the many possible crosses of *Brunsvigia* species with *Crinum* species, only a few have been made. The following are on record:

Brunsvigia rosea major ♀ x *Crinum moorei* ♂ (many have flowered) = *Crinodonna corsii.*

Brunsvigia x *rosea minor* ♀ x *Crinum moorei* ♂ (several have flowered) = X *Crinodonna corsii.*

Brunsvigia x *parkeri* ♀ x *Crinum moorei* ♂ (several have flowered) =X *Crinodonna traubii.*

Brunsvigia rosea major ♀ x *Crinum bulbispermum* ♂ (have not flowered to date) =X *Crinodonna* sp.

Brunsvigia rosea major ♀ x *Crinum americanum* ♂ (have not flowered to date) =X *Crinodonna* sp.

In addition *Brunsvigia* rosea has been crossed with *Crinum* x *powellii* cl. 'Cecil Houdyshel'; and with the clone 'Elizabeth Traub' *(Crinum scabrum* x cl. 'Ellen Bosanquet'); and *Brunsvigia* x *parkeri* with the clone 'Ellen Bosanquet'; but none of these have flowered up to the present time (see Traub, 1961).

Isolating Mechanisms.—The herbarium taxonomist in many cases pays little or no attention to bigeneric hybrids made under cultivation since he considers only plants collected in the wild as important. This is obviously unscientific and short-sighted. Therefore, in the present study herbarium specimens have been carefully preserved on a basis equivalent to that for wild plants.

Although the scientist is not interested in utility as such, it is pertinent to mention that the intensive study of, and experimentation with, bigeneric hybrids will provide important information on the genetic relationships between the taxonomic groups concerned. So far, the data uphold the thesis that *Brunsvigia* and *Crinum*, with decided morphologic (distichous or biflabellate vs. radial arrangement of leaves) and genetic gaps between them, are valid biologic genera. The hybrids are a curious mixture from the standpoint of leaf arrangement. Some show a distinct tendency toward the distichous arrangement of leaves, others show an

intermediate—somewhat bi- or tri-flabellate—arrangement. Others show a tendency toward the radial arrangement of leaves. Thus the great morphologic gap between the parents that is easily visible, appears to be the pattern of leaf arrangement. More important, however, from the standpoint of genetic isolating mechanisms, are the gene mutations of the chromosomes, including those responsible for leaf arrangement, which remain to be studied in detail. All of the crosses so far made have given rise to sterile hybrids.

If the experiments under way to polyploidize the sterile X *Crinodonna* clones and thus obtain fertility should succeed, these would throw light on one possible evolutionary mechanism for the origin of genera.

KEY TO THE SPECIES AND NAMED CLONES OF **X CRINODONNA**

[The key is based on hybrids described through October 1960.]

1a. Bulb ovoid, with neck, rather large; leaves showing tendency toward distichous arrangement; flowers white or pink .... 1. **corsii**

2a. Flowers white — no clone yet named

2b. Flowers light, medium or deeper pink:

3a. Flowers light or medium pink:

4a. Flowers light pink, fading to almost whitish with age; tepaltube 3.5—3.6 cm. long; tepalsegs 7.5—8.4 cm. long; pedicels 3—3.5 cm. long .... 1a. **corsii** cl. **'Lon Delkin'**

4b. Flowers medium pink; tepaltube 4 cm. long; tepalsegs 7.1—8.2 cm. long; pedicels 2—3 cm. long:

5a. Flowers pinkish rose, deeper in center of the tepalsegs and at the apex .... 1b. **corsii** cl. **'Dr. Ragionieri'**

5b. Flowers rhodamine pink (HCC-527/1), darker on the face downwards, passing into white on the back along the keel .... 1c. **corsii** cl. **'Fred Howard'**

3b. Flowers deeper pink (Persian rose, HCC-628/1) on opening, fading to lighter pink with age; tepaltube 3.7—4.2 cm. long; tepalsegs 7.5—8.4 cm. long; pedicels 2—6 cm. long .... 1d. **corsii** cl. **'Dorothy Hannibal'**

1b. Bulb globular, with neck, smaller; sometimes in addition, a tubular basal leaf-sheath; leaves showing a tendency towards a more or less distichous, or to a more or less radial, arrangement; flowers white, pink or purple .... 2. **traubii**

6a. Flowers white .... no clone yet named

6b. Flowers pink or purple:

7a. Flowers rhodamine pink (HCC-628/2), white throat, apricot at extreme base; tepaltube 2.7 cm. long; tepalsegs 6.8—7 cm. long; pedicels 1.3—2.4 cm. long .... 2a. **traubii** cl. **'Alma Moldenke'**

7b. Flowers purple .... no clone yet named

1. X **Crinodonna corsii** Ragionieri ex Traub, **hybr. nov.**

X *Crinodonna corsii* Ragionieri, Staff in Bot. Mag. Lond. 153: plate 9162. 1927 (1929).

Syn.—X *Crinodonna memoria corsii* Ragionieri, Gard. Chron. LXIX: 32, fig. 17. 1921; Bull. Soc. Tosc. XLVI: 20. 1921; Year Book Amer. Amaryllis Soc. (Herbertia), 1: 64. 1934; X *Amercrinum Howardii* J. Coutts, in Gard. Chron. Ser. 3, LXXVIII: 411, fig. 171. 1925.

Planta bulbosa; bulbo tunicato ovoideo vel globoso; collo brevi usque ad mediocriter longo tunicato; foliis ad ordinem distichum; floribus albis vel rubellis ceterum descriptionem originalem generis hybridi bigenerici persimilibus.

TYPE: Description and figure (Gard. Chron. Lond. p. 32, fig. 17, Jan. 15. 1921 = X *Crinodonna corsii* cl. 'Dr. Ragionieri', see 1b. below.

Description.—Plant evergreen, vegetating chiefly at the end of summer; rootstock an ovoid tunicated bulb with neck; leaves more or less distichous, strap-shaped; scape solid; spathe 2-valved; umbel 8—17- or more-flowered; flowers pedicellate, white or pink; tepaltube 3.5—4 cm. long; limb of 6 tepalsegs, bilaterally symmetrical; stamens and style fasciculate-declinate-ascending; anthers finally crescent-shaped; stigma minutely trifid.

These are hybrids between the Cape Belladonna, *Brunsvigia rosea* (various forms) and *Crinum moorei* (various forms). The clones 'Dr. Ragionieri', 'Fred Howard' and 'Lon Delkin' are fairly similar since they are crosses of *Brunsvigia rosea* (forma *major)* ♀ and *Crinum moorei* (forma *roseum)* ♂; the flowers are light pink to medium pink. The clone, 'Dorothy Hannibal' represents a cross of *Brunsvigia rosea minor* ♀ with *Crinum moorei* (forma *roseum)* ♂ and its flowers are deeper pink.

The white clones from crosses of the pale *Brunsvigia rosea* (forma *major)* ♀ with *Crinum moorei* (forma *album)* ♂ have not been named up to the present.

1a. X **Crinodonna corsii** clone **'Lon Delkin',** Traub, in Plant Life 10: 49. 1954.

Syn.—X *Crinodonna corsii* clone 'Delkin's Find', Plant Life 10: 49. 1954.

Description.—*Bulb* ovoid, with an elongated neck. *Leaves* present at time of flowering, evergreen, 47 cm. long, 3—4 cm. wide, narrowing somewhat towards the base, and towards the acute apex, more or less distichous, strap-shaped, recurved, flat or shallowly channeled downwards, laterally grooved. *Scape* solid, somewhat flattened, with roundish edges, dark green to fuscous-reddish in lower ¼, lighter green above, up to 63 cm. tall, 1.1 x 2.2 cm. in diam. at the base, 0.9 x 1.2 cm. in diam. at the apex. *Spathe* green, 2-valved, lanceolate with infolded edges, apex truncate to roundish. *Umbel* 9—16-flowered; flowers light pink on opening, fading to lighter pink or almost whitish with age, fragrant; perigone slightly curved. *Pedicels* 3—3.5 cm. long at anthesis. *Ovary* 1.4—1.9 cm. long, 5—7 mm. in diam., ovules about 6 per locule. *Tepaltube* 3.5—3.6 cm. long, 4—6 mm. in diam. at the base, 9—9.5 mm. in diam, at the apex, greenish in lower 1/3, changing to white above. *Tepalsegs* lanceolate, acute, 8.5—9.3 cm. long, 2.2—3.2 cm. wide. *Stamens* about ¾ as long as the segs, anthers crescent-shaped, versatile; *Style* slightly longer than the stamens, but shorter than the segs. *Stigma* minutely 3-lobed.

HOLOTYPE: Traub No. 681a+b (TRA), 8-14-53, cult. Arcadia, Calif. Additional specimens: Traub No. 689a+b (TRA), 7-14-58, cult. La Jolla, Calif.; Traub No. 680a+b (TRA), 8-9-59, cult. La Jolla, Calif.; Traub No. 821a+b (TRA), 9-4-59, cult. La Jolla, Calif.

The parentage of this clone is unknown, but from its morphological characters appears to be a cross similar to those made by Dr. Ragionieri and Mr. Howard—the Cape Belladonna, *Brunsvigia rosea* (forma *major)* ♀ and *Crinum moorei* ♂. The clone was obtained by Alonzo C. Delkin, of Arcadia, Calif., from Mr. Tom Shimoda, of Monrovia, Calif., in 1943, who had collected it in a field in the City of Los Angeles many years ago before the population had expanded to its present proportions. The clone has been named for Mr. Delkin who is an outstanding amateur horticulturist and amaryllidarian, who rescued it from oblivion and brought it to the attention of the public.

1b. X **Crinodonna corsii** clone **'Dr. Ragionieri',** new clone.

Ragionieri, in Gard. Chron. *LXIX: 32*, fig. 17. 1921; Bull. Soc. Tosc. Ortic. *XLVI:* 20. 1921.

TYPE (NOMENIFER) DESCRIPTION AND FIGURE.—(Gardeners' Chronicle (Lond.), p. 32. fig. 17, Jan. 15, 1921) ". . . Plant evergreen, the chief period of vegetation occurring at the end of summer. Bulb—8.9 cm. in diameter, ovoid, with rather fibrous tunic, plentifully proliferous, with a neck about 15 cm. long. Leaves 10-12 to a bulb, drooping sometimes, showing a tendency to be distichous, dark green, more or less carinate, 3-4 cm. broad, 70-90 cm. long. Peduncle—stout, compressed, green with a purplish tone at the base, lightly glaucous, 50 cm. long. Spathe valves—about 13 cm. long, 3 cm. broad, with a rose coloured stripe occupying the third central portion in its whole length. Perianth [perigone] with a slightly curved tube [tepaltube], 14 cm. long; segments [tepalsegs] acuminate, the three external ones [setsegs] 2 cm. broad, the interior ones [petsegs] 3 cm. [broad]; colour pinkish rose, more deep in the center of the segments [segs] and at their apex. Filaments—shorter than the corolla [tepalsegs] and of the same colour. Anthers—linear. Style—rather shorter than the perianth [perigone], colour dark rose pink. Stigma—trifid. Flowering time, August."

Article 45 of the Code for Cultivated Plants (1958) provides that when a cultivar of an interspecific hybrid is introduced into cultivation, it must be given a cultivar name in addition to the collective name, even if only one cultivar of the hybrid is concerned. This provision apparently refers to intra-generic and inter-generic hybrids. Accordingly, the name, 'Dr. Ragionieri' is proposed for the type clone cultivated in Italy.

This is a hybrid between the Cape Belladonna, *Brunsvigia rosea* (forma *major)* ♀ and *Crinum moorei* ♂.

1c. X **Crinodonna corsii** clone **'Fred Howard',** new clone.

Syn.-X *Amarcrinum* J. Coutts, in Gard. Chron. Lond. Ser. 3, *LXXVIII:* 411, fig. 171. 1925; X *Crinodonna crosii* Ragionieri, Stapf in Bot. Mag. Lond. *153:* plate 9162. 1927 (1929); Bull. Missouri Bot. Gard. *21:* plate 6. 1933.

DESCRIPTION.—*Bulb* ovoid, with elongated neck. *Leaves* more or less distichous, strap-shaped, recurved, flat or shallowly channeled downwards, laterally grooved, acute, up to 70 cm. long, 3—5 cm. wide, dark green. *Scape* solid, somewhat compressed, with blunt edges, 70—81 cm. tall, 1.3 x 2.5 cm. in diam. at the base, 5 x 12 to 9 x 13 mm. in diam. at the apex, reddish in lower 1/3. *Spathe* 2-valved, lanceolate, green, margins infolded, 8.5—9 cm. long. *Umbel* 8—12—16—17 or more-flowered; flowers rhodamine pink (HCC-527/1), tepalseg tips deeper pink, amberish deep in throat, whitish throat, changing to lighter pink (HCC-527/2) with age; fragrant. *Pedicels* 2—3 cm. long. *Ovary* 1.1 to 1.7 cm. long, 5 x 6 mm. in diam.; ovules about 6 in a cell. *Tepaltube* slightly curved, 4 cm. long, 5 mm. in diam. at the base, 8—9 mm. in diam. at the apex. *Tepalsegs* lanceolate, acute, 7.1—8.2 cm. long, 2-4—3.2 cm. wide. *Stamens* about 2/3 as long as the segs, anthers crescent-shaped, versatile. *Style* slightly longer than the stamens, but shorter than the segs. *Stigma* minutely trifid.

SPECIMENS: J. Coutts, brief description, with figure, in Gard. Chron. LXXVIII: 411, fig. 171. 1925. Specimens: Traub No. 70 (TRA), 9-16-49, cult. Beltsville, Md., greenhouse; Traub No. 628a+b (TRA), 8-20-59, cult. La Jolla, Calif.; Traub No. 686a+b+c (TRA), 8-25-59, cult. La Jolla, Calif. (Holotype)

In order to distinguish this clone from the clone 'Dr. Ragionieri', it is necessary to give a new name to the hybrid made by the late Fred H. Howard in California. This is also a hybrid between the Cape Belladonna, *Brunsvigia rosea* (forma *major)* ♀ and *Crinum moorei* ♂.

1d. X **Crinodonna corsii** clone **'Dorothy Hannibal',** Traub in Plant Life 8: 85. 1952.

DESCRIPTION.—*Bulb* ovoid, neck elongated. *Leaves* evergreen, strap-shaped, narrowed somewhat towards the base, and towards the acutish-bluntish apex, more or

less distichous, recurved, flat or shallowly channeled downwards, laterally grooved, up to 58 cm. long, 3—4.8 cm. wide. *Scape* solid, 69 to 75 cm. tall, somewhat flattened, with rounded edges, 1.1 x 2.1 to 1.3 x 2.1 cm. in diam. at the base, 8 x 11 to 9 x 12 mm. in diam at the apex. *Spathe* 2-valved, lanceolate, 8.5—10 cm. long, margins infolded, apex acutish-roundish. *Umbel* 15—16—18-flowered, flowers held horizontally or somewhat upright, medium pink (Persian rose, HCC-628/1 = vivid reddish purple DCN-236) on opening, fading to lighter pink (HCC-628/3) with age; fragrant. *Pedicels* 2—2.2—2.5—6 cm. long. *Ovary* 1.5 cm. long, 5—6 mm. in diam., ovules about 6 per locule. *Tepaltube* slightly *curved*, 3.7—4.2 cm. long, 4.5—5 mm. diam. at the base, 7—8 mm. in diam. at the apex. *Tepalsegs* 7.5—8.4 cm. long, 2.2—2.9 cm. wide, lanceolate, acute. *Stamens* about ¾ as long as the segs, anthers crescent-shaped, versatile. *Style* slightly longer than the stamens but shorter than the segs. *Stigma* minutely 3-lobed.

HOLOTYPE: Traub No. 133a+b (TRA), 2-24-50, cult. Beltsville, Md., greenhouse. Additional specimens: Traub No. 134a+b+c (TRA), 3-9-50, cult. Beltsville, Md., greenhouse; Traub No. 688a+b (TRA), 8-29-59, cult. La Jolla, Calif.

This is a departure from the X *Crinodonna* clones already discussed since it is a cross between the late-flowering form of the Cape Belladonna, *Brunsvigia rosea* (forma *minor)* ♀ and *Crinum moorei* ♂, made by Mr. L. S. Hannibal of Fair Oaks, Calif. The color of the flower is deeper pink and the plant is somewhat smaller.

2. X **Crinodonna traubii** Moldenke, in Plant Life 17: 60. 1961.

Description.—Plant evergreen, vegetating chiefly at the end of summer; rootstock a globular tunicated bulb with neck, and in addition, a tubular basal leaf-sheath above the neck; leaves more or less distichous or sometimes more or less radially arranged, strap-shaped; scape solid; spathe 2-valved; umbel 8—18- or more-flowered; flowers pedicellate, white, pink or purple; ovary oblong, ovules about 6 per locule; tepaltube 2.7 cm. long (in type), sometimes shorter, or longer; limb of 6 tepalsegs, bilaterally symmetrical; stamens and style fascisulate-declinate-ascending; anthers finally crescent-shaped; stigma minutely trifid.

HOLOTYPE: Traub No. 809a+b (TRA), 8-25-60, cult. La Jolla, Calif. = clone 'Alma Moldenke'.

These plants represent quite a different kind of X *Crinodonna* from those already considered since they are the result of crosses between the hybrid, *Brunsvigia* x *parkeri* W. Watson ex Traub (various forms) and *Crinum moorei* Hook. f. (various forms). *Brunsvigia* x *parkeri* originated in Australia many years ago, and involves crosses between the Cape Belladonna, *Brunsvigia rosea* (various forms) and the two *Brunsvigia* species, *B. grandiflora* and *B. josephinea* (Traub & Hannibal, 1960).

The hybrids obtained in this class of X *Crinodonna*, up to the present, have the tubular basal leaf-sheath above the neck. The bulbs are smaller and globular in contrast to the larger shaggy ovoid bulbs of X *Crinodonna corsii*, plants of X *Crinodonna traubii* appear to be more truly evergreen than in X *Crinodonna corsii* in which the plants rest in summer in a manner similar to *Crinum moorei*.

Up to the present, only one clone has been named, but many of these hybrids have already been made and other beautiful clones will be named in the future including the entire color range from white, to pink and purple.

2a. X **Crinodonna traubii** clone **'Alma Moldenke'** Moldenke in Plant Life 17: 60. 1961.

Description.—*Bulb* globose, making offsets freely, 8 cm. in diam., bulb neck 2.5 cm. long, 3.3 cm. diam., tubular basal leaf-sheath, 9 cm. long, 3 cm. in diam.; *leaves* 16 or more, more or less radially arranged, lorate, canaliculate, margins somewhat undulate, narrowing to an acutish-roundish apex, lettuce green (HCC-861), up to 54 cm. long, 5.5 cm. wide at the base, 6.0 cm. wide about ¼ from base, narrowing gradually to the apex; *scape* solid, flattish, with rounded edges, 64 cm. long, 1.4 x 2.4 cm. in diam. at the base, 1.0 x 1.4 cm in diam. at the apex, glaucous, somewhat rusty-reddish near the base; *spathe* 2-valved, lanceolate, 7.3 cm. long, green and rusty-reddish, margin infolded, apex acutish-rounded; *umbel* 10-flowered, 25 cm. in

diam., flowers delicate rhodamine pink (HCC-527/2) inside of the flower, with white throat and apricot-colored at the very base, lighter pink on upper part on outside, turning to whitish down to middle of tepaltube, changing to lighter pink with age, thus at any one time there may be flowers of three shades of pink in the umbel; flowers 8 cm. across face; stamens and style white in lower ¾, pink above; *pedicels* 1.3—2.4 cm. long; *ovary* 11 mm. long, 5 x 6.5 mm. in diam., *ovules* abortive, few in a locule; *tepaltube* curved, 2.7 cm. long, 5.5 x 6 mm. at the base, 10 mm. in diam. at the apex; *tepalsegs* oblanceolate, setsegs 7 cm. long, 2.3 cm. wide, apex acute, apiculate; petsegs 6.8 cm. long, 2.8-2.9 cm. wide, apex acute, apiculate; *stamens* attached at the throat of the tepaltube, of 4 different lengths, fasciculate, declinate-ascending, about 2/3 as long at the segs, anthers versatile, 9 mm. long, pollen cream-colored; *style* overtopping the stamens, but shorter than the segs; *stigma* minutely trifid.

HOLOTYPE: Traub No. 809a+b (TRA), 8-25-60, cult. La Jolla, Calif.

This X *Crinodonna* clone is the result of a cross between *Brunsvigia* x *parkeri* (Australian group) clone 'Hathor' ♀ and *Crinum moorei* (forma *roseum*) ♂. It is notable that offsets are produced freely in contrast to several siblings which make few if any offsets.

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[PLANT LIFE LIBRARY, continued from page 172.]

BIOLOGICAL AND CHEMICAL CONTROL OF PLANT AND ANIMAL PESTS, edited by L. P. Reitz. American Association for the Advancement of Science, 1515 Massachusetts Av., N. W., Washington, D. C. 1960. pp. 285. 11 illus. Index. $5.75. The papers in this symposium were presented by nineteen outstanding authorities at the 1957 meeting of the American Association for the Advancement of Science. Part I is concerned with the exclusion and eradication of plant and animal pests; the control of forest diseases and insects; education in the use of pesticides; and regulatory control of pesticides. Part II is devoted to recent advances in chemical control of plant diseases, weeds, insects, and internal parasites of domestic animals. Part III deals with biological control of various pests, including also breeding for resistance to diseases and insects. This is required reading for all interested in the control of plant and animal pests.

EVOLUTION ABOVE THE SPECIES LEVEL, by Bernhard Rensch. Columbia University Press, 2960 Broadway, New York. 1960. pp. 419. illus. $10.00. This English translation is based on the German edition with some revisions. It was written during the latter part of the last war in Germany "with the intention of proving that very probably the major trends of evolution are brought about by the same factors that bring about race and species formation." This was written without knowledge of parallel work by American specialists in this field who had come to similar conclusions which are now corroborated by the work of Dr. Hensch. After considering the causative factors of infraspecific evolution, the following topics are discussed: six types of race and species formation in nature; undirected and directed transpecific evolution; absolute speed of evolution; phylogenetic branching; progressive evolution; evolution and life; autogenesis, ectogenesis, and bionomogenesis; and evolution of phenomena of consciousness. This outstanding book is required reading for all biologists.

BANANAS, by N. W. Simonds. Longmans, Green & Co., 119 W. 40th St., New York 18, N. Y. 1959. pp. 466. illus. This scholarly book deals with the cultivation of the banana, exclusive of the technology of the distributive trades. First, the botany of edible bananas is considered. This is followed by discussions of the climate and soils; planting and management; harvesting, transportation and ripening; composition and utilization of the fruit; production and economics; history; pests and diseases; and banana breeding. This outstanding book on the banana is highly recommended.

BIOLOGY OF MYCORRHIZA, by J. L. Harley. Interscience Publishers, 250 5th Av., New York 1, N. Y. 1959. pp. 233. illus. $8.75. It is generally known that the roots of many plants form specialized mycorrhizal organs in association with fungi. This text by an outstanding authority presents the known scientific facts about this subject which show that mycorrhiza are functional absorbing organs. Part I deals in general with the association of roots with fungi. Part II is concerned with the ectotrophic mycorrhizas of forest trees; the fungi of ectotrophic mycorrhizas; the physiology of salt absorption, and the ecology of, ectotrophic mycorrhizas. Part III is devoted to endotrophic mycorrhiza,—in Ericales and Orchidaeae; other mycotrophic plants with separate endophytes; and mycorrhizas caused by aseptate mycelia. This important book is of importance not only to foresters, horticulturists, agronomists, but also is required reading for all biologists.

[PLANT LIFE LIBRARY, continued on page 106.]

Fig. 11. "Weaning" bed for young vegetatively propagated Amaryllis stock, and transplanting semi-mature bulbs for spring shipment. Amaryllis nursery of Leon Boshoff-Mostert, Balfour, Transvaal, South Africa.

[Caption—continued on lower page 77—opposite.]

3. GENETICS AND BREEDING

AMARYLLIS IN SOUTH AFRICA

LEON BOSHOFF-MOSTERT, *Kleinskuur,*
P. O. Box 84, Balfour, Transvaal, South Africa

[PART 2—CULTIVATION AND BREEDING; CONTINUED FROM PAGE 110, PLANT LIFE, 1960]

In order to have a clear mental picture and proper appreciation of the methods of culture of the amaryllis in South Africa (see Fig. 11 for propagation procedure), it is necessary to be acquainted with South African climatic conditions. Our geographical situation in relation to the equator has an important bearing on cultural methods which, broadly speaking, greatly vary from those generally in vogue in the United States. I am purposely employing the term "broadly speaking" for the reason that in the South, along the regions of the Gulf of Mexico and also in Southern California, I came across amaryllis in private gardens grown by methods similar to those practised here in my own country. I understand this also applies to Florida which, unfortunately, owing to pressure of time, we were not able to visit.

In the Union of South Africa, the amaryllis is predominantly an outdoor plant, although it is often seen indoors in pots during the blooming season. But in such cases the pots, with their flowering bulbs, are brought indoors for decorative purposes. Our climatic conditions are such that the necessity for indoor culture falls away and the amaryllis becomes a garden subject, very often grown for cut flowers.

The object of conservatories or glass houses, whether equipped with an artificial heat control system or otherwise, is to protect plants or

[Caption—continued from bottom of page 76—opposite.]

Upper, "weaning" bed for young vegetatively propagated *Amaryllis* stock, under hinged glass covers. These are constructed from corrugated steel sheets cut to a length of 4 feet from which a portion of 30″ x 18″ is removed and a reinforced glass sheet fitted. The bed itself, with front and back brick walls, 24″ and 30″ high, respectively, is 3 feet wide by 48 feet long and annually accommodates approx. 2,500 young bulblets. These remain in the "weaning" bed for almost a year, by which time they have developed sufficiently for transplanting in open beds, where they come into full bloom after another two years. This view was photographed last year, 9 months after removal of the tiny bulblets from the "incubators". As can be seen, some of the leaves were then already over 24″ long. As soon as the bulblets show signs of "taking", they are fed fortnightly, by watering with a special *Amaryllis* plant "food" which is dissolved at the rate of one tablespoonful to a gallon of water. It does push them along. I used to have similar, if not even better, results with liquid manure. No! But what a messy job!!

Lower, this view shows where I am busy transplanting semi-mature bulbs in early spring for shipment the same year. Incidentally, some of those bulbs seen in the view will already be in America by the time this letter reaches you. The open beds are 4′—6″ wide and the rows are spaced at 1 foot. The bulbs are also planted 12″ apart. At present (August 15, 1960) I have 122 such beds with a total combined length of 4,780 feet.

bulbs, as well as their blooms, against the destructive effect of the elements attendant upon the natural climatic conditions characteristic to the location or area in which the plants are grown. On the whole, South Africa has a temperate climate. Spring and Fall are moderate, Summer is warm to hot and Winter is cold. But even during extremely cold Winter spells when snow falls upon the higher mountain ranges, the atmosphere warms up during the day when the sun shines brightly from our clear cloudless skies. Consequently, freezing of the soil is a very rare phenomenon, even at an altitude of some 6,000 feet where we live on a high plateau, known as the Transvaal Highveld which lies in the South African corn belt.

Since the amaryllis is a Spring flowering bulb, which remains dormant during the Winter, there is no necessity for the protection of the blooms against frost. On the other hand, our Winters are not so severe as to threaten destruction of the bulbs by ground freeze in the open beds. Admittedly, incessant frost over protracted Winter spells does damage the necks and shoulders of the bulbs in the open ground and suitable measures must be taken for the protection of the bulbs against such direct frost on the exposed portions.

For the ordinary home gardener the provision of such protective measures entails very little time and practically no effort. All that is required is some dry straw, hay or bean or other crop husks as a protective covering over the bulbs. In order to avoid excessive growth of weeds during Spring and early Summer cultivation, the choice of the covering blanket should be confined to material which, as far as possible, is free from seed. This may become a difficult matter for the large-scale grower, such as I am, if up to an acre of beds has to be covered each season with the advent of frost, when the straps start wilting and the bulbs enter dormancy. At first, the work entailed in weeding during Spring, after removal of Winter covering, was not only a back-breaking but also a heart-breaking job. Ways and means for the elimination of this extra (and obviously avoidable) work were soon evolved. Natural grasses are cut in the green stage before there is a possibility of maturity of seed. These are left in the open to dry and then stacked in heaps conveniently staggered in the locality of the beds to provide for effortless and expeditious covering when the time arrives. The bulbs are then covered to a depth of a few inches. This ensures a reasonably even soil temperature of the beds throughout the Winter when the bulbs are dormant and, at the same time, they are protected against frost damage.

Although regular normal frost in itself would not destroy the bulbs—unless such frosts are accompanied by repeated freezing and thawing of the soil—it can, nevertheless, have a harmful effect on the bulbs which will manifest itself in the ultimate Spring blooms having blotches and streaky discolourations.

The removal of the Winter covering is an equally simple operation. This is done as soon as the dangers of damage by frost have passed. The material is again neatly stacked in readiness for application the following season. In order to prevent deterioration—especially at the

bottom layers of the covering medium after heavy rains, it may be stacked on wooden poles laid parallel on the ground and conveniently spaced to permit of a free passage of air.

After the beds have been uncovered, they are watered and lightly cultivated between the bulbs. By this time, first signs of Spring growth become evident and the first buds of the earlier blooms start showing. This is also when new root growth starts developing and the bulbs start feeding from the soil after Winter dormancy. From now on, it is essential that the beds be regularly watered and kept reasonably moist all the time.

The treatment described in the foregoing paragraphs has bearing, naturally, only on the conditions applying to our Southern Transvaal Highveld and similar areas where Winter rains are a rarity and our Summer rains are about 26 to 30 inches per annum with, most often, very dry spells between showers or summer downpours. Being at an elevation of 6,000 feet, the air currents are dry and, consequently, the soil also dries out quickly under the basking Summer sun—hence the necessity for regular watering, preferably a good and proper weekly soaking of the beds.

In the Western Province of the Cape where the late Mr. Buller evolved his strain, conditions are entirely different. It is a Winter rainfall area and the soil is wet throughout the dormant spell. Despite the cold and wet, there is no frost, and covering is not required. As in the Transvaal and other frost belts, the straps wither during Winter and new leaf and root growth start in early Spring whilst peak bloom is reached more or less during corresponding periods. Owing to almost complete absence of rain during the blooming season in the Western Cape, the blooms there generally present themselves in a better shape of perfection than in other Provinces where heavy rains, with upward splashes of soil-polluted water, sometimes cause stains and other rain blemishes on the petals and thus detract from their value for exhibition purposes.

My first crosses were effected in 1948 from the initial parcel of Buller bulbs. Those were the days when I was still groping in the dark without any clear-cut idea as to what I should have in mind in regard to ultimate results. There was no hybridizing programme mapped out and in an entirely unorthodox fashion pollen was being applied indiscriminately to any and every available bloom. Furthermore, no records were kept of crosses with the result that there were no possible means eventually of determining parentage.

Subsequently, during Mr. Buller's visit to Kleinskuur and also during my visit to his farm, I was to have my instruction in the art of hybridizing. Now, this is an intricate and involved business and to me, will always remain such because of my countless failures and in spite of my occasional rewarding triumphs. It is an unpredictable venture. Be that as it may. The starting point is a detailed study of those particular clones on which one wishes to work. The choice is confined to those with definitely and determinably interesting, desirable and attractive features which embrace colour, texture, form, size, number of florets,

substance of bloom, length and sturdiness of scape and general vigor of growth, etc. The object is to breed out of a good amaryllis any undesirable characteristic by the introduction of pollen from another variety in which that particular characteristic is favourably and strongly emphasized. Then continue along those lines until all inherent weaknesses are eliminated in the progeny and the desirable aspects of the parents are established in one or more seedlings created along those breeding lines. These are then further propagated vegetatively by cuttage.

I was, naturally, singularly fortunate in having my tuition and instruction from an octogenarian with a wealth of knowledge and practical experience accumulated over a span of half a century. I was also truly appreciative of this unique privilege. Needless to say, my present hybridizing programme is still formulated along those lines with results sufficiently encouraging to maintain my breeding enthusiasm. But, secretly, I am still sorry that those orderly methods of breeding were acquired so early in my career as a hybridist—not that they have in any way minimized the romance of the mysteries which are eventually to be unfolded in the appearance of a new unexpected creation. The reason for my regret is that, from those first year haphazard crosses, has sprung forth new colour-breaks which neither Mr. Buller nor I had thought possible.

In this connection I may add that to the thirty-six different colours in the varieties originally acquired from Mr. Buller, seventeen more have been added over the past twelve years, bringing up the total to fifty-three distinctly different colours in the present Kleinskuur collection. During my visit to the United States in 1960, about which I shall have more to say presently, I was very happy to acquire a number of species, including a yellow and a blue [lilac-colored; *Worsleya rayneri*, syn.—*Amaryllis rayneri*], through the generosity and co-operation of Dr. Traub, Professor Ira Nelson and Messrs. Everett and Politi of the New York Botanical Gardens. On these I am going to work with all the enthusiasm and energy at my disposal and, who knows, along with my own hybrids, there may one day come to light the hybrid amaryllis of my dreams.

It is not intended that space in this article be given to any genus other than the amaryllis. But for the purpose of illustrating the point I now wish to make, it is necessary to refer to the iris. This, after all, is my wife's first love (or do I come first?) and America is iris country. The American Iris Society has over 6,000 members and there are certainly many times more iris lovers with presentable collections in the U. S. A. who are not members of the Society. The first month of our visit was taken up by amaryllis, whilst the other two were devoted to iris. We saw literally hundreds of iris gardens in half a dozen or more States—some large gardens and some small gardens, ranging from 25 acres down to a few small beds or a border in a suburban garden. Among these, commercial and amateur growers alike, there was not a single one who did not have some shape of seedling patch. The remarkable feature which impressed us during those garden visits was that

some of the finest of the hybrids of the day were bred by the backyard amateur. This is indeed a phenomenal achievement. I repeat, phenomenal, because my own personal experience in amaryllis breeding is that not more than five or six seedlings in every thousand are as good as, or an improvement in some direction, on the selected parents. My information—and it is highly authoritative, is that the proportions in iris breeding are even less favourable. Now, if those achievements through amateur perseverance are possible in the iris world, why should not the same apply to the amaryllis?

This may sound like bad business policy—and maybe it is, coming from a commercial grower whose object it should be jealously to guard his domain. But, I feel it is more than high time that the amateur amaryllis grower in America should devote more time and attention to breeding. It will be found a most rewarding effort and definitely a gratifying one, whilst not interfering with any of the attention demanded by the purchased clones to bring them into bloom to that state of perfection which would put them in the running for the coveted Blue Ribbon or even the Tricolor at the annual show.

Earlier, I have stated, having regard to climatic conditions in South Africa, there is no need for growing amaryllis in hot-houses. In any case, with such a wide range and choice of outdoor flowers, the average South African just cannot be bothered with pampering any species or varieties of plants which are suited only to artificially created hot-house conditions. And neither is he prepared to entertain the costs involved. This applied equally to the late Mr. Buller. Gradually, with the passing of time, he systematically eliminated those varieties lacking in vigour and devoid of substance of bloom, until, over the years, he had built up that strain which to-day is a challenge to the severities and extremities which even our elements may wish to offer during the changing seasons.

Therefore, if for no other reason, I am looking forward to the day when there will be American strains of hybrids with substance which is so sorely lacking in the majority of the best blooms I saw, not only on show benches, but also in gardens and in conservatories. These remarks are not offered by way of negative criticism. I have, in fact, been assured by eminent authorities on their subject that, prior to World War II, there were several growers who introduced American bred hybrids with exceptional substance, in addition to having all other desirable qualities. Moreover, these were bred in open nurseries, which strengthens my argument that such strain could again be built up in the States, since the breed has not yet been completely lost in America.

As this is intended to be a frank expression of conclusions arrived at, based on close personal observation, I wish to state that the American hybrids, whilst lacking in attraction from the point of view of the show bench, generally have much better substance than the imported varieties which caught the eyes of the judges at shows. But here I wish to emphasize that those cup-winning imported varieties would be well nigh useless for landscaping or garden planning such as I saw at Mobile,

Alabama where, in one garden alone several thou and American hybrids were used to good advantage by Mr. W. Oakley Cobb in turning a pine forest into a beautiful park.

In Corpus Christi, in the garden of Mrs. Billie Harris, I saw some of her own attractive hybrids in the full blazing Texas sun without a sign of blemish, whereas some of the fine imported varieties, owing to lack of substance, showed signs of scorching and bleached patches. These remarks can also be related to the garden of Mr. Bill Schortman of Porterville where American hybrids, completely in the open, defied the California heat and sun. With perseverance and patience the American strains, undoubtedly, can again be built up to that degree where they embody all the other aspects which go to make the perfect amaryllis. My convictions in this direction are unshakable and here is the reason: Whilst the imported varieties generally overshadowed the American hybrids for attraction in colour and beauty of form, one of the finest specimens which ever it was my pleasure to admire, grows in the garden of Dr. Robert G. Thornburgh in Palos Verdes Estates, California. In drawing comparisons, I exclude neither the Buller or my own hybrids, nor the Dutch hybrids at their best. Here was an amaryllis that offered everything to gladden a hybridist's heart and to stir all his senses with envy. It will call attention to itself from afar, even in the midst of the best that had ever been introduced. And what substance! It is a Howard and Smith hybrid and should be a source of inspiration to every amaryllis fancier in America to put this country forcibly on the map of world breeders.

And now, before stepping off this point, I must reiterate that the amaryllis, whilst admirably suited to indoor culture, is primarily an outdoor plant. For that reason, an equally primary object of the hybridist should be to breed a sturdy, hardy variety with all the substance necessary to make it an outdoor plant under all reasonable climatic conditions which do not, of course, include ground freezing. Under the latter conditions, by all means use it as an indoor plant and, even then, the better substanced varieties, owing to their better lasting qualities, are much more rewarding than their weaker, flimsy sisters.

I trust that I am not approaching dangerous premises and it is certainly not my intention to raise controversial issues, but I am urged to make further references to some of my observations in America—mainly about shows and judging and the preparation and presentation of show specimens. Certain fundamental requirements in shows must, by the very nature and purpose of those institutions, be observed by exhibitors and judges alike. One cannot, obviously, think of a show without well defined and prescribed requirements and standards. So long as civilized and organized society functions, so long will conventions have to be observed, but one should always be fully alive to the danger of enslavement to conventions and prescriptions and the loss of imagination and individualism as a result of the unquestioning acceptance of the dogma and dictates of a few who claim to have a monopoly on tastes, likes and dislikes. This is not a slant on those who evolve show schedules or point

scoring cards. These things are essential because there must be generally accepted standards, there must be prescribed targets and there must be some direction in which the ultimate goal of perfection is to be found.

To the judges I would say this: When judging a specimen, pay more heed to the exhibit confronting you and less attention to your score card. Look at its general appearance—the manner in which it presents itself. Ask yourself whether it is a pleasing balanced unit, whether it has a pleasing compact shape, whether it is attractively proportioned, whether the colour is in conformity with the requirements for the specific variety and whether it commands spontaneous admiration. Then let your judging be largely based on the answers to these questions. The beauty of an amaryllis—and this must at all times be borne in mind, is not determined by the number of florets to the scape or their size. After all, if you multiply one unattractive floret by five, you have done nothing more than to increase unattractiveness five-fold. A well-proportioned healthy scape with three large florets may well be a greater object of beauty than one with a fourth floret added, which may conceivably give an appearance of top-heaviness and overcrowding, which does certainly not enhance the beauty and attraction of a specimen, irrespective of what the well-meaning score card tells you. Furthermore, study the score card with some degree of imagination and interpret its objects with intelligence. The score card is a general guiding factor whilst appreciative, artistic and intelligent judging will come naturally to those who have sufficient interest in the amaryllis to stimulate their desire to became judges. Parrot-style learning by heart of prescribed score cards or judges' manuals and passing of oral or written judges' examinations with flying colours do not necessarily turn out competent judges. And to judging instructors I would say: Do not impose your personal tastes, biases and prejudices on your students, but rather endeavour to guide them in the development of their own individuality. Personally, I did not consciously meet any judging instructors so, fortunately, these remarks are not directed at any particular individual.

To the exhibitor I would say: Since the purpose of a show is to enable you to present your entry in a physical and visual condition as near as possible to perfection, do not be disappointed when obvious defects, even though beyond your control, cause the Blue Ribbon to slip through your fingers. Before a show, expose your exhibits to sufficient direct sunlight so as to ensure a true colour of blooms and a healthy green in the straps.

In conclusion, let me assure my readers that I have seen more beautiful amaryllis in America than I could ever have expected. Possibly that is the reason why so much space has been devoted to American activities in an article on growing amaryllis in South Africa.

And now, I take this opportunity, if the Editor will permit me, of expressing, on behalf of my wife and myself, our sincere appreciation of all the kindness showered upon us during our visit to America. Busy people sacrificed much of their valuable time for our entertainment and comfort. Pen acquaintanceships were moulded into lasting friendships,

to which were added yet many more dear friends of whom we did not know until we arrived at the various centres included in our itinerary. I would like to tell the world that there are no strangers in America, the hospitality of whose citizens is unparalleled.

FIRST FLOWERING OF NEWLY IMPORTED BOSHOFF-MOSTERT HYBRID AMARYLLIS

W. QUINN BUCK, *Los Angeles State and County Arboretum, Arcadia, California*

A group of amaryllis bulbs received from South Africa last September gave a foretaste of what can be expected from them. This first blooming was in many ways untypical because none of the bulbs arrived with any live roots; it is, therefore, difficult to make any fair appraisals of these fine things from Mr. Leon Boshoff-Mostert, Kleinskuur, Balfour, Transvaal, South Africa.

Mr. Boshoff-Mostert dispatched his carefully packed parcels of bulbs on a ship sailing July 29th. Two parcels reached us September 8th, the third arriving September 16th. Most of the flower spikes were far advanced on arrival; the first to flower was 'Corpus Christi', which opened five days after potting. Others followed in quick succession.

The most outstanding thing about this group of hybrids was the exquisite porcelain quality of the white flowers as well as of the white portions of some of the patterned flowers. The smoothness of the white in the beautiful picotee 'Corpus Christi' (2)* was evident again in 'Dallas Bride' (4), pure white and with a soft green throat. 'Dallas Bride' had a flat flower, narrow rather than rounded, but altogether beautiful. 'Bridal Bouquet' (2) had this same superb texture, together with fine shape and a beautiful pattern of lines and dots.

'Pink Reflection' (3) had good round flowers, creamy white with wide pink edge and greenish throat. 'Stained Glass' and 'Geranium Lake' (5) were two other beautiful pink-edged flowers, very pleasing in color. 'Impertinence' (3,3) was a full flower with a white star surrounded by a pattern of bold lines, all very pink in effect. 'Dawning' (2) had nice pink-lined areas bordering the very full petals.

'Leah Williams' was white with light red wide striped pattern, and with excellent shape. 'Robespierre' (2,2) on one spike showed similar pattern on all segments, while on the other spike the wide stripes were only on the upper half.

Among the reds 'Etna' (2) had good shape and clear orange-red color. 'Dagbreek' (3), and 'Cathedral Peak' (2) were two very dark selfs, while 'Cardinal Wolsey' (2) was a lighter cardinal red of wonderful shape.

'Signal Hill' (2) had fine shaped flowers, white stars in an orange-red ground. The unnamed 71-58 (2) was outstanding for shape, color,

* The numbers in parentheses indicate the number of florets per umbel; (2,3)=2 flowers in one, and 3 flowers in another umbel; etc.

and pattern, as well as for its wonderful texture; the small white star glistened against the velvety red ground color, which was repeated at the base of the segments as a sort of outline for the stamens.

To sum up, these first flowers were exciting and sometimes completely disappointing. All were small, short-stemmed, and many opened so poorly that they have not been mentioned; some, as indicated, showed themselves as very wonderful things. It will be doubly exciting to get them to flower normally on well-established bulbs after they have adjusted to our northern hemisphere; only then can we judge them fairly for size; shape, texture, and number of flowers to the spike.

[Editorial Note.—Under date of Oct. 24, 1960, Mrs. B. E. Seale, Dallas, Texas, writes—"A beautiful white *Amaryllis* from Mr. Boshoff-Mostert is now in bloom—has two scapes—one has four, and the other has three blossoms. They are just exquisite—also the foliage has grown right along with the scapes."]

HADECO AMARYLLIS HYBRIDS GROWN IN SOUTH AFRICA

Robert D. Goedert, *Florida*

The Hadeco Strain of *Amaryllis* from South Africa was originated by a few Dutch (Holland) growers who immigrated there about twelve years ago.

They discovered several forms of Hybrid *Amaryllis* in the area that had naturalized there. These *Amaryllis* were very vigorous; free flowering and made offsets freely. This gave them the idea of hybridizing them with the large-flowering Dutch. They have hybridized on a very large scale and have kept only the best types and have now developed a strain which they claim is very vigorous, free flowering and more adaptable to outside culture than the large-flowering Dutch.

They are now increasing the stock of the most outstanding clones which will be named. They plan to introduce these to the American trade in about three years. At present they have about 400 seedlings which they are growing from which to select named clones. Out of these 400 possibly 30 or 40 of the best will eventually be introduced.

They also have large stocks of seedlings coming along each year. Out of these seedling stocks the best are selected and marked by color. They are chosen for their form, color and size. These are sold by color as selected hybrids in the United States and Canada. Red and orange-red are the dominating colors. However they offer a fair quantity of wine-red each year and smaller quantities of mahogany-red, violet-red, rose and pink. The red shades of the selected hybrids are usually solid colors. The rose and pink shades often have white in them, however a fair percentage of them are solid colors. Some might be classed as red and white rather than rose or pink and white.

Seedlings that are not up to a certain standard are destroyed. The remaining seedlings after the selections have been made are dug out and sold as mixed hybrids.

Since the bulbs are grown in the southern hemisphere they ripen off in June or July and are ready to ship in July or early August. They usually are available to the trade in the United States from September to April. They can be flowered very early the first year. Reports from those who flowered these amaryllis the past year indicate that the Hadeco *Amaryllis* is a worth while strain. Apparently this race of *Amaryllis* is one of the largest flowering strains as many reported flowers over 10″ in diameter, and there was one report of a 12″ flower. There are some most beautiful flowers among this strain especially in the dark red tones. I am told by the Holland distributor of this strain of *Amaryllis* that the selected strain to be received this season (1960-61) will be even a better selection than those received last season.

When named clones of this strain are available there is little doubt that they will be most welcome.

X-RAY INDUCED MUTATIONS IN AMARYLLIS HYBRIDS

Robert G. Greenler, *Wisconsin*

In the last several years there have been some very exciting developments in the methods of plant breeding. It has been shown that new characteristics can be introduced into plants which have been treated with X-rays in some stage of their development. In the past the plant breeder has worked at combining the desirable characteristics of various plants in an improved hybrid variety by controlled crossing and selection of promising progeny. However, he always kept a sharp lookout for the plant mutation which might spontaneously appear and which would provide him with a new plant characteristic, not previously present in the plant population. It appears now that the plant breeder may be able to take a more active role in producing desired changes in a plant species than to work only with the mutations occasionally provided by nature.

The specific cause for the spontaneous appearance of a new plant characteristic in a species of plants is not generally known. It is known that the number of mutations which will appear in plants grown from seed, for example, may be greatly increased by exposing these seeds to X-rays before they are planted. This is not the only treatment which will increase the mutation rate; certain heat treatments and the action of several chemicals (the best known of which is colchicine) as well as exposure to gamma rays, ultraviolet light, and neutrons have also been shown to have an effect in altering the genetic constitution of a plant species. The possibility of willfully producing new mutations would seem to have tremendous potential value. However, before we succumb to visions of a new plant industry which will produce custom-tailored

mutants to fit your order, we should consider the expected nature of the genetic changes produced by x-radiation.

Any of the gene-transmitted characteristics of a plant may be liable to mutation. For example, its size, growth habit, leaf form, flower shape, disease resistance, fruit yield, and, in fact, all the characteristics, which taken together define the plant species, may in some way be altered by mutation. There is no guarantee that these changes will be desirable. The fact that a plant species exists is, in itself, a demonstration that the plant is highly adapted to survive all the possible mishaps which are provided by its environment. Those plants that are successful in the continuing struggle for existence are the result of the natural selection of mutations which have occurred after countless generations of plants. Mutations which are not favorable to a plant species' survival have been discarded by natural selection as they have arisen, and those which are desirable have survived. Therefore, the plants, with which we start to work, are developed to the point where we expect most of the random changes which are introduced by x-radiation to be deleterious to the plant's chances for survival. Nevertheless, there still may be mutations which will increase the survival chances for the plant in the environment in which we place it. One way in which its survival chances may be increased is that it have a flower form or crop yield which appeals to man so that he cultivates it, distributes its seed, and shields it from various agents of destruction.

The first step in the production of mutants by seed irradiation is to determine the radiation sensitivity of the particular plant. This varies greatly from one species to another and must be determined specifically for each plant. The work reported here has been done with seeds of Ludwig's hybrid amaryllis, white, orange, pink, salmon, and Gracilis varieties, plus seeds of another yellow-throated, salmon hybrid of unknown origin. The data on all the hybrid amaryllis seeds are grouped together in the results which are reported. The seeds of each variety were divided into several groups; each group received a different X-ray exposure * except for one control group which received none. The seeds were planted on edge in pots containing a one-inch layer of sand and peat over a conventional soil mixture. Seeds of the control group and each of the different irradiated groups were planted in each pot to insure identical cultural conditions for seeds with different X-ray treatments. The criterion for survival in these experiments was taken to be the existence of leaves 65 days after planting time. At this time, a few of the irradiated seeds had sprouted and died, and a few others died later; however, choosing a longer time after planting would not have altered the results significantly. One of the obvious effects of radiation is to increase the time required for germination of some seeds;

* The seed was exposed to the x-radiation from the tungsten target of an AEG-50 tube operated at a voltage of 50 KVP with a tube current of 45 milliamps. Filtering was provided by 0.004 inches of copper and the seeds were located 43 millimeters from the axis of the tube. The intensity calibration was effected by using Kodak Personal Monitoring Film No. 2 (slow emulsion only) at a tube current of 4.5 milliamps. At 4.5 milliamps the exposure was calculated to be 3.0 roentgens/sec.

hence, a time much shorter than 65 days would not have been adequate. Since data was taken from seeds raised in two different seasons, allowance has been made for the difference in germination rate of the control seeds by calculating the survival rate of the exposed seeds relative to that of their controls. (The survival rate for controls was 76% and 82%). Figure 12 shows the percent survival rate of amaryllis seedlings for different X-ray exposures. Each point represents data from approximately 40 seeds.

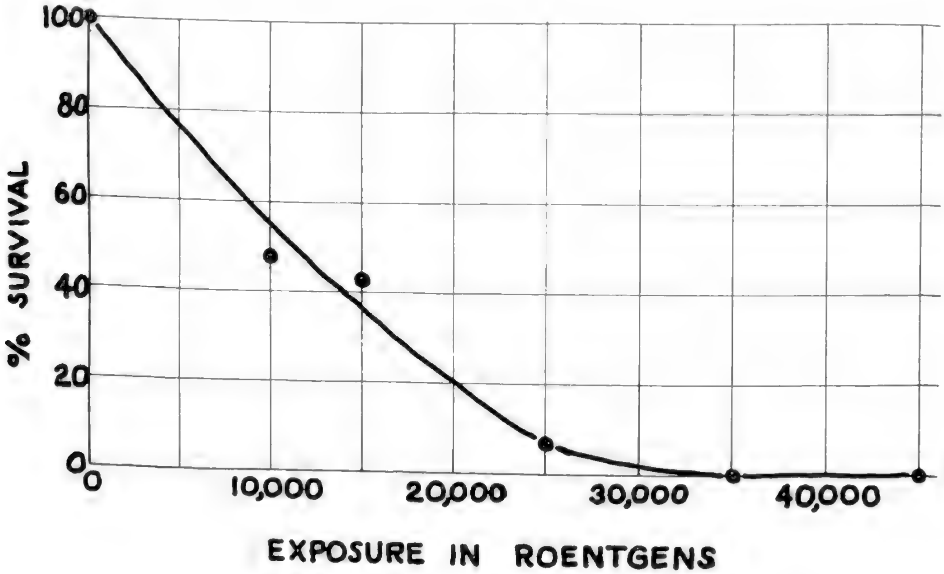

Fig. 12. Percent survival (relative to the control survival percentage) of hybrid *Amaryllis* seeds exposed to x-radiation.

Even with this curve the optimum X-ray exposure for inducing mutations is not obvious. If seeds receive a very large dose of radiation, a high mutation rate is expected, but it does us little good if none of the seedlings survive. At the opposite end of the curve a low dose will permit a high survival rate but would be expected to produce few mutations among the seedlings. There is evidence that for some type of changes the number of mutations produced is just proportional to the X-ray exposure. If this is true, the total number of mutations expected to be present in a group of plants which grew from a fixed number of irradiated seeds should be proportional to the radiation exposure received by the seeds multiplied by the survival rate of the seedlings at that exposure. Figure 13 shows such a curve plotted from the data in Figure 12. This curve has a maximum value at about 12,000 roentgens exposure; that is, we would expect that an exposure of 12,000 roentgens would produce a greater total number of mutations in the resulting plants than would be produced by either a greater or

smaller exposure. It is seen that this exposure produces a survival rate of about 50 percent. One way of specifying radiation sensitivity of plants is to give that radiation dose which will be lethal to 50 percent of the irradiated plants. We see that this dose (sometimes abbreviated as LD-50) comes conveniently close to the optimum dose which we have determined from Figure 13.

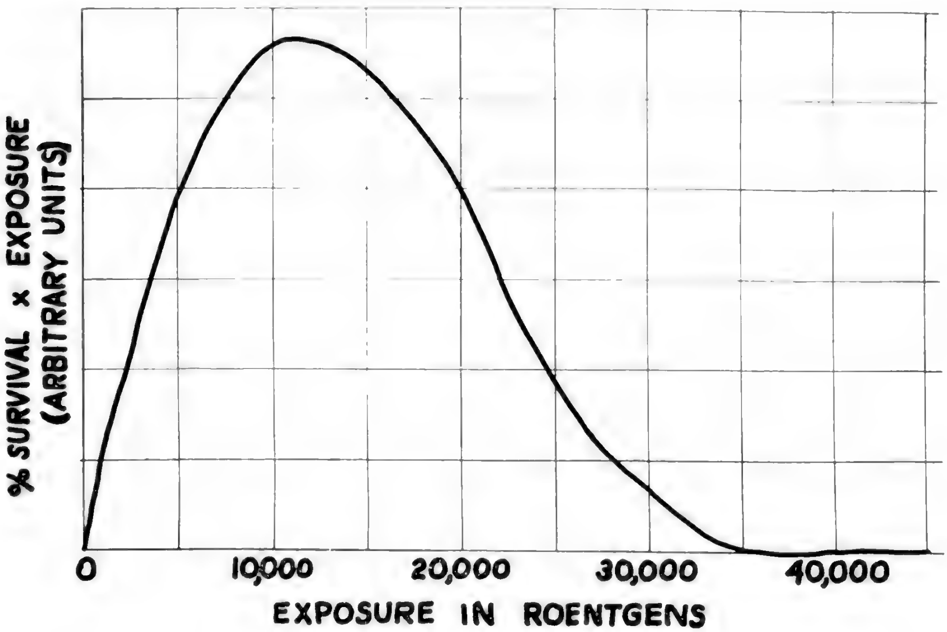

Fig. 13. Total number of mutations surviving from a fixed number of irradiated *Amaryllis* seeds calculated as function of exposure to x-radiation.

Perhaps visible mutations will show up in the plants which grow from irradiated seeds. On the other hand, recessive traits introduced by seed irradiation will not show up in these plants but will show up in the next generation of plants grown from the seed produced by self-pollination.

It is too easy for popular writing to oversell the importance of a promising new development, the real significance of which is still in the speculative stage. I expect to see such articles appearing in the next few years, heralding a new revolution in man-made plants. Although radiation treatment has already been shown to be a useful tool in the development of desirable plant characteristics, particularly in the development of certain agricultural crop plants, it is difficult to foresee just how important a tool to plant development it will become. One thing seems clear: X-ray treatment is not going to be a magic wand which will transform any plant it touches into a super plant. The utility of radiation treatment in the production of new plant characteristics lies in its ability to provide a wide variety of new charac-

teristics from which one will occasionally be found which is desirable. At this point the work of plant hybridizers will begin, combining this characteristic with other desirable traits into a useful plant. The realistic chances of a person who irradiates a few, or even a few hundred, seeds of suddenly producing a startling new amaryllis form are really quite remote; but then, on the other hand, you can never tell. . . .

HYBRIDIZING WITH 'HANSEN'S GREEN' AMARYLLIS

CHARLES A. RAMELLI, *Biloxi, Miss.*

'Hansen's Green' hybrid *Amaryllis* (see Fig. 14)—which will be registered next year—is a segregate among Dutch in the garden of a friend. The pollen was used first in the spring of 1959 to cross with Dutch whites, salmons, oranges and purplish reds—thus trying to create as many color variations as possible. There are 50 to 200 seedlings of some of the crosses which are in their second year's growth.

Fig. 14. 'Hansen's Green' hybrid *Amaryllis,* as grown by Charles A. Ramelli, Biloxi, Mississippi. Photo by C. A. Ramelli.

This spring (1960), 'Hansen's Green' pollen was used both ways but as a mother plant it only set two large pods of seed—one on bloom toward yellow and one toward purple or blue. The pollen was used this year throughout the entire garden on many of which I have only one of kind from 13 years of hybridizing.

My original parent plants were a Dutch red and a pink and white stripe of unknown origin bought in a seed store 20 years ago. When the first seedling bloomed F-2 crosses were made of the most beautiful and exceptional in color. In the meantime some of them took blue ribbons at the Shows. Then the best of the named Dutch and Australian

hybrids and species were added to bring in new genes. Some of the hybrids with the species attracted as much attention this spring as the imported ones from Holland, Australia, India, Japan, S. America and Africa.

The Garden (Figs. 15 and 16) is a riot of color when in bloom and has been a "traffic-stopper" on our street thus forcing me to open my "one man garden exhibit" of hybrid amaryllis free to the public each spring for the past four years. On week-ends there are 50 to 150 visitors

Fig. 15. *Amaryllis* garden of Charles A. Ramelli, Biloxi, Mississippi. Reproduced from C. A. Ramelli kodachrome.

per day who enjoy the beauty which "God" creates in our *Amaryllis*. This has done more to interest flower lovers in *Amaryllis* along the whole Mississippi Gulf Coast than anything I know of.

All the imported *Amaryllis* are labeled for easy identification to visitors; all are in special beds. There should be about ten thousand seedlings in bloom for the first time in the spring of 1961, and the same number the following spring when the first spot blooming of the 'Hansen's Green' hybrids may show. It is getting to be more than I can possibly keep up with as a hobby; especially the use of my vacation time (from my full time job) to keep the garden open for the public.

In the hybridizing the work has been toward the creation of new patterns, and combinations of colors toward the yellows, blue-reds and purple shadings. There were some rewarding seedlings toward the purple side this spring. From now on each spring these hybrids should

be of greater interest to many who are interested in the new colors and patterns especially those from the 'Hansen's Green' when they come into bloom.

Fig. 16. *Amaryllis* display beds, garden of Charles A. Ramelli, Biloxi, Mississippi. Reproduced from C. A. Ramelli kodachrome.

BREEDING WHITE AND DOUBLE AMARYLLIS

WILLIAM W. WALLIS, *Florida*

Several years ago, an ordinary red (Mead Strain) *Amaryllis* seed parent, was crossed with pollen from a pure white hybrid *Amaryllis* that had been treated with colchicine by the late T. E. Moore, of Miami. The progeny bloomed in two years from seed. Some are white with a few reddish streaks; a few are pure white (see Fig. 17), but these flowers are somewhat smaller than the former. Whether or not the colchicine treatment had any effect is not known, but Mr. Moore's plant had a tight cluster of large bulbs (original bulb with attached offsets) at the ground surface, and this character, along with the flower color was carried through to the progeny almost unchanged, as indicated in Fig. 17. In any case, the vigor of the progeny has been far above that of the seed parent.

My experience with the breeding of double *Amaryllis* is limited. My above described vigorous white hybrid was crossed with pollen from *Amaryllis belladonna* var. *semiplena (albertii)*, the old original double

scarlet from Cuba. Two of the progeny from this cross have bloomed, each with moderate-sized frilled pink flowers, the two being quite alike (see Fig. 18 for one clone).

For the record it should be stated that several years ago, a friend gave me two *Amaryllis belladonna* var. *semiplena (albertii)* bulbs that he had collected from cultivation in Medillin, Colombia, but no difference was noted from plants I already had of the same variety.

Fig. 17. Hybrid white *Amaryllis* produced by William W. Wallis of Miami Beach, Florida. Reproduced from W. W. Wallis kodachrome.

This year, I applied pollen from a double red hybrid *Amaryllis* (McCann hybrid, from a grocery store rack) to flowers of my vigorous white *Amaryllis* hybrid (Fig. 17), and the seedlings are growing well.

DOUBLENESS IN HABRANTHUS

Alek Korsakoff, *Florida*

In 1955, I obtained a bulb of *Habranthus brachyandrus* from the Fairchild Tropical Garden, Miami, Florida. This plant had the unusual habit of producing double flowers once in a while. This bulb was later (probably in 1957) sent to Mrs. Clint. Most of its seedlings that were retained usually have some tepaloid stamens. *Habranthus robustus*

seeds were obtained from the U. S. Plant Introduction Garden, Chapman Field, Florida. The seedlings obtained from these seeds had very pale pink, wide open, and larger flowers than the usual *Habranthus robustus.*

In 1958, seedlings of the *Habranthus brachyandrus* mentioned above were crossed with pollen from the pale pink *Habranthus robustus.* This cross gives *Habranthus* x *floryi* (see Plant Life p. 121. 1951). In 1959, the seedlings began to bloom; some with two flowers to the scape; one produced double flowers, and this was potted separately. In 1960, it bloomed again and the flower was again double (see Fig. 19). In June

Fig. 18. Hybrid double *Amaryllis* produced by William W. Wallis of Miami Beach, Florida. Reproduced from W. W. Wallis kodachrome.

1960, this bulb was sent to Dr. Flory at Blandy Experimental Farm for experimental use. There were eight offsets, the largest about acorn size, the smallest about 1/4 inch in diameter. None has any leaves.

Again, one of the seedlings of the *Habranthus brachyandrus* from the Fairchild Tropical Garden produced a double bloom in 1959 and it was selfed; five good seedlings resulted. The first bloom from these seedlings opened on July 27, 1960, and it was double, but not as double as my *Habranthus* x *floryi* mentioned above. On August 4, 1960, a second seedling bloomed, again a double flower. The three other seedlings are very small, one has two leaves, only about two inches long.

Further reports on the double *Habranthus* will be made in future issues of the Amaryllis Year Book.

Fig. 19. Double form of *Habranthus brachyandrus* bred by Alek Korsahoff of Miami, Florida. Reproduced from Korsakoff snap-shot.

'HIGH TOPPER' MUTATION IN HEMEROCALLIS

Hamilton P. Traub, *California*

Among the diploid *Hemerocallis* seedlings grown by the writer for the purpose of breeding better pink clones there appeared an unusual mutation in the semidouble class. The mutation appeared among crosses of 'Winged Victory', clear lemon yellow to buttercup yellow, with an unnamed pink seedling.

In this mutation, four of the filaments are transformed into tepalsegs (tepaloids) with the anthers attached toward the apex. The other two filaments are normal. The four tepaloid filaments stand up straight and form a crown that is reminiscent of the perpendicular part of a hat. The six tepalsegs are more or less horizontal; somewhat reflexed and form the brim of the "hat" (see Fig. 20). The color of the flower is light salmon pink. Normally the clone should have been named "High Hat", but unfortunately that name had been used as early as

1949, and the name 'High Topper' (Traub, 1961) had to be chosen. It is being distributed on the assumption that others might also want to use it in breeding.

Fig. 20. 'High Topper' (Traub, 1961) mutation in *Hemerocallis*. Grown by Hamilton P. Traub, La Jolla, Calif.

The writer is not overly fond of the super-doubles in *Hemerocallis*, but this new mutation is really beautiful in form, and is not dumpily heavy. Attempts are being made to produce other colors in the 'High Topper' shape by appropriate crossings. Only by making crossings will it be possible to determine if the mutation can be transmitted to the progeny. 'High Topper' will also be polyplodized so that this mutation, if possible, can go into the great reservoir of tetraploid germ plasma.

In this connection, Mr. George Gilmer has pointed out that apparently the Kraus semi-doubles are of the 'High Topper' type.

X CRINODONNA BREEDING REPORT, 1960

HAMILTON P. TRAUB, *California*

The writer started collecting material for the breeding of X Crinodonnas in 1953, and began making crosses in 1956. The main objective was to obtain white- and deeper pink-flowering seedlings. This was extended to include lower growing seedlings in 1959, and was further extended into a general X *Crinodonna* breeding project for the production of a wide range of growth habits and flower shapes and colors. The results obtained through 1959 are summarized in Table 1.

It should be explained that the hybrid bi-generic hybrid genus X *Crinodonna* accommodates all crosses between *Brunsvigia* and *Crinum* (see the genus X *Crinodonna*, Plant Life, vol. 17. 1961). Up to the present, only *Brunsvigia* ♀ x *Crinum* ♂ progeny have been reported, but it is hoped that the reverse cross, at least in some instances, may yet be obtained.

RESULTS THROUGH 1959

X CRINODONNA TRAUBII.—At the time that this project was started, the few X Crinodonnas that had been introduced had pale or slightly deeper pink flowers. The first crosses were therefore made to produce white-flowering seedlings. For this purpose *Brunsvigia* x *parkeri* (Australian group) clone 'Hathor' (pure white with apricot-colored throat) was used as the seed parent, and *Crinum moorei* forma *album* was utilized as the pollen parent. All attempts to reverse this and use *Crinum* as the seed parent have failed. Entries #1 and #3 in Table 1 show that so far 8 seedlings have been obtained. All seeds were white and produced evergreen seedlings. Two of these have bloomed up to the present and are white-flowering.

As shown in entry #2 in Table 1, when a slightly pink-colored *Crinum moorei* form was used as the pollen parent on 'Hathor', 11 seedlings were obtained. No record was kept of the seed color, but all seed that sprouted are evergreen, and very vigorous. So far several of the 11 seedlings (entry #2, Table 1) have flowered. All are pink-flowered.

The seedlings listed under entries #1, #2, and #3 are a new kind of X *Crinodonna* since the parentage is different from that of X *Crinodonna corsii*, the bulbs are not very large, the leaves are more or less radially arranged, and the plants tend to remain in full leaf even through the summer, when X *Crinodonna corsii* clones with large shaggy bulbs tend to rest in summer in a manner similar to *Crinum moorei*.

The first X *Crinodonna* hybrids made by Dr. Ragionieri, in Italy, and Fred H. Howard, in the United States, are crosses between the Cape Belladonna, *Brunsvigia rosea* (Lam.) Hann. (seed parent) and *Crinum moorei* (pollen parent). All other crosses between the Cape Belladonna and Crinum are therefore known as X *Crinodonna corsii*. The crosses between *Brunsvigia* x *parkeri* and *Crinum* represent a new kind of hybrid as already indicated, and Dr. Moldenke has named it X *Crinodonna traubii* with the clone 'Alma Moldenke' as the type (see Plant

TABLE 1. X **Crinodonna traubii** and X **Cr. corsii** seedlings raised at La Jolla, Calif. from 1956 through 1959 with the objective of breeding (I) white-flowering, (II) dwarfer, and (III) other types, of seedlings. Records taken to Aug. 16, 1960.

Seed parent (♀)	Pollen parent ♂	Date planted; seed color	Germinated, white seeds	Germinated, colored seeds	vigor of seedlings
		I. X Crinodonna traubii			
#1. **Brunsvigia x parkeri** (Australian group) cl. **'Hathor'**	**Crinum moorei** var. **moorei album**	9-30-56 few white *	3 evergreen †	———	medium vigor
		no colored seeds	———	———	———
#2. Ditto	**Crinum moorei** var. **moorei roseum**	9-30-56 white * and colored ** seeds not separated	11 all seedlings	evergreen †	very vigorous
#3. Ditto	9-28-57 **Crinum moorei** var. **moorei album**	number white * no record	evergreen † ———	———	medium vigor
		no colored seeds	5	———	———
#4. **Brunsvigia x parkeri** (Zwanenburg group) cl. **'Cape Town'**	Ditto	10-5-59 many white *	42 evergreen †	———	½ as vigorous as evergreen #5
		Many colored **	———	many 67 deciduous ‡	medium vigor
#5. Ditto cl. **'Jagersfontein'**	Ditto	10-8-59 many white *	16 evergreen †	———	very vigorous; twice as vigorous as evergreen #4
		many colored **	———	2 deciduous ‡	medium vigor
		II. X Crinodonna corsii			
#6. **Brunsvigia rosea** var. **major**	**Crinum moorei** var. **minor roseum**	9-3-59 many white *	5 evergreen †	———	very tiny
		colored ** no record	———	———	———
			Total number 82 evergreen † seedlings		

* Seeds ranged from greenish, greenish-whitish, whitish-yellowish to white; for brevity they are all indicated as "white".

** Colored seeds ranged from pink, pink-white-blotched, whitish mottled brownish.

† X **Crinodonna** plants similar to **Crinum moorei** in habit resting in summer, or different and evergreen the whole year. All indicated as "evergreen".

‡ Plants deciduous, similar to **Brunsvigia x parkeri** and **B. rosea.**

Life 17: 60. 1961). In this clone the flowers are a delicate rhodamine pink inside the flower on opening, with white throat, and apricot-coloring at the very base; lighter pink on upper part on the outside turning to whitish downward to the middle of the tepaltube. With age, the flower color changes to a lighter pink so that at any one time there may be different flowers in three shades of pink in the same umbel. The flowers are delightfully fragrant.

Entries #4 and #5, Table 1, show that *Brunsvigia* x *parkeri* (Zwanenburg group) clones 'Cape Town' and 'Jagersfontein' are excellent seed parents for X *Crinodonna traubii* seedlings when the former are crossed with the white form of *Crinum moorei*. In the first instance, 42, and in the second, 16, X *Crinodonna traubii* seedlings were obtained. In this case the seeds were separated on the basis of color before planting. It should be noted that the white seeds gave rise to evergreen seedlings (X *Crinodonna)*, and that the colored seeds gave rise to deciduous *(Brunsvigia* x *parkeri)* seedlings. The latter are apparently parthenogenetic seedlings and will reproduce the parent type. It is not possible to explain at the present time why only white-colored seeds represent crosses.

X CRINODONNA CORSII.--Entry #6, Table 1, shows that when the Cape Belladonna, *Brunsvigia rosea* (♀) was crossed with the dwarf form of *Crinum moorei*, 5 X *Crinodonna corsii* seedlings were obtained. These were still tiny by Aug. 16, 1960, indicating that the objective of obtaining lower growing X Crinodonnas may possibly be realized.

PEDICEL ELONGATION IN BRUNSVIGIA

Table 2 shows that the application of the pollen of the hybrid Crinum clone 'Ellen Bosanquet' to the stigma of *Brunsvigia* x *parkeri* (Zwanenburg group), rarely leads to seed setting. In contrast, the use of the pollen of *Crinum moorei* on the same *Brunsvigia* hybrid results in the setting of many seeds.

Table 2 also shows that when ovules were not fertilized, the pedicels did not elongate, and that, in this case, the elongation of the pedicel after pollination, within limits, is proportional to the number of seeds in the capsule. The non-elongation of pedicels in the case of unfertilized ovaries has been amply substantiated in the past, but the rest of these results may be misleading. Observations over the years indicate that sometimes even a few seeds in the capsule leads to extreme elongation of the pedicel after pollination. The cause of pedicel elongation is apparently bound up with the production of growth hormones by the growing ovules which gradually develop into the seeds. Aside from the actual number of seeds in the capsule, pedicel length may be greatly influenced by the particular favorable or unfavorable genes in the developing ovules that regulate hormone production. This may explain why sometimes even a few seeds in the capsule may lead to extreme pedicel elongation. Thus the phenomenon of pedicel elongation in *Brunsvigia* needs to be investigated further.

No data were taken on the size of the seeds which vary from small to large in these hybrids.

TABLE 2. Correlation of the number of fertilized ovaries as shown by number of seeds in capsule with pedicel length at seed maturity. 14-flowered umbel of **Brunsvigia x parkeri** (Zwanenburg group), La Jolla, Calif. Sept. 25, 1960.

Seed parent (♀)	Pollen parent (♂)	Number of capsules	Number of seeds	Pedicel length in cm.
Brunsvigia x parkeri (Zwanenburg group)	Hybrid **Crinum** cl. **'Ellen Bosanquet'**	4 *	0	2.2—2.8 **
Ditto	Ditto	1	2	4
Ditto	Ditto	1	3	6.5
Ditto	**Crinum moorei major roseum**	1	5	9
Ditto	Ditto	7	many	12-–16.5

* The arrested ovaries which never developed further dropped off after a time, leaving the pedicel which did not elongate.
** No elongation of pedicel after pollination.

1960 CROSSES

A number of X *Crinodonna* crosses were made in the autumn of 1960. At this writing (Oct. 8, 1960), only a few seeds have germinated and a fuller report has to be reserved for the future. It is important to note in Table 3 that as these and other similar hybrids come into flower, we can expect a far greater variety in X *Crinodonna* than was thought possible only a few years back. The species of *Crinum* crossed on *Brunsvigia* has been extended from *Crinum moorei* only to include also *C. bulbispermum* and *C. americanum*. In future years, the *Crinum* species utilized can most likely be greatly extended. The pollen parent, hybrid *Crinum* cl. 'Elizabeth Traub' represents a cross of *Crinum scabrum* with hybrid *Crinum* cl. 'Ellen Bosanquet'. The latter, parentage unknown, differs markedly from hybrid *Crinum* x *powellii* cl. 'Cecil Houdyshel'. 'Ellen Bosanquet' has *Crinum moorei* as one of its parents, but what the other one, or ones, are may be difficult to establish unless the cross could be duplicated experimentally.

X CRINODONNAS, HYBRID BRUNSVIGIAS AND RHODOPHIALAS

MRS. KENNETH B. ANDERSON, *California*

X CRINODONNAS.—It's fun to grow X Crinodonna seedlings (hybrids between *Brunsvigia* and *Crinum*). There are so many variations, and they are so very satisfactory as decorative plants; needing a minimum of attention in cleaning up the old foliage. Although the seed parent is the *Brunsvigia*, they resemble the pollen parent, *Crinum moorei* in most respects. Their foliage is even superior to it, and truly

TABLE 3. X Crinodonna crosses made in the autumn of 1960. Data as of Oct. 8, 1960.

X **Crinodonna** species	Seed parent	Pollen parent	Remarks
X **Crinodonna corsii**	**Brunsvigia rosea major**	**Crinum moorei** forma **album**	7 seeds (6 greenish; 1 pink)
X **Crinodonna** sp.	**Brunsvigia rosea major** (Bolivia)	Hybrid **Crinum** cl. 'Ellen Bosanquet'	34 seeds (2 white; rest pink)
Ditto	**Brunsvigia rosea major**	Ditto	3 pink seeds
X **Crinodonna** sp.	Ditto	Hybrid **Crinum** cl. 'Elizabeth Traub'	10 greenish seeds (small to medium); one germinated
X **Crinodonna** sp.	Ditto	**Crinum** x **powellii** cl. 'Cecil Houdyshel'	9 medium seeds (3 white; 6 pink)
X **Crinodonna** sp.	Ditto	**Crinum bulbispermum album**	6 white seeds (2 medium; 2 small; 2 tiny)
Ditto	Ditto	Ditto	3 green seeds (1 medium, germinated; 2 tiny)
X **Crinodonna** sp.	Ditto	**Crinum americanum**	3 seeds (pinkish)
X **Crinodonna traubii**	**Brunsvigia** x **parkeri** (Australian group) cl. 'Hathor'	**Crinum moorei** forms **album**	18 seeds (1 white; 17 pink)
Ditto	Ditto	Ditto	many seeds (1 white)
Ditto	**Brunsvigia** x **parkeri** (American group) cl. 'Hathor' seedling	Ditto	many seeds (9 white; rest pink)
Ditto	Ditto	**Crinum moorei roseum**	Many seeds
Ditto	**Brunsvigia** x **parkeri** (Zwanenburg group)	Ditto	Many large pink seeds
X **Crinodonna** sp.	**Brunsvigia** x **parkeri** (American group) cl. 'Hathor' seedling	**Crinum bulbispermum album**	Few white seeds
X **Crinodonna** sp.	Ditto	Hybrid **Crinum** cl. 'Ellen Bosanquet'	18 seeds (5 white; rest pink)
Ditto	**Brunsvigia** x **parkeri** (American group) cl. early bicolor	Ditto	15 large pink seeds
Ditto	**Brunsvigia** x **parkeri** (Zwanenburg group) cl. 'Windhoek'	Ditto	3 large pink seeds
Ditto	**Brunsvigia** x **parkeri** (Zwanenburg group) cl. 'Pretoria'	Ditto	6 medium pink seeds
Ditto	**Brunsvigia** x **parkeri** (Zwanenburg group) unnamed clone	Ditto	4 large pink seeds

evergreen, never dying down at all or looking ragged as *Crinum moorei* foliage does just before blooming. The plants are clean and vigorous and the stout stems rise well above the foliage; 3 to 4½ feet high. The flowers range from pure white to deep rose and varying degrees in between. Some are a very light pink with a rose picotee edge. There is another range of color within each head of flowers itself. The buds show a deeper color than the freshly opened flower, and the flowers as they mature tend to blend into a solid color before fading (a trait of their *Brunsvigia* parent); so there are flowers and buds of several shades and patterns all on one plant at one time.

Most flowers are tubular or slightly bell shaped with tepalsegs somewhat twisted, but the better ones open up their faces and are truly nice flowers. They number anywhere from 10 to 23 blossoms per scape and usually two scapes per bulb, coming three to five weeks apart. Bloom starts about September first and continues into November. As soon as they become large clumps I'm sure that their season will be extended, for I have watched a huge clump of X *Crinodonna corsii* clone 'Fred Howard' bloom all summer and through late fall with as many as 15 to 20 stalks in bloom at one time.

HYBRID BRUNSVIGIAS.—After blooming over a hundred seedlings of *Brunsvigia* x *parkeri*, I find that there are roughly two different types, though they overlap somewhat due to having crossed the two types. One type with 14 to 27 blossoms per umbel appears to have a creamy yellow look to the entire head; the apricot tint of the throat shows through on the outside, making the bud a creamy apricot. Even the stamens and pistil are deeply stained with the apricot coloring. The flowers are ruffled and wide open with recurved tips, and many of the heads have flowers facing outward in a complete circle, as opposed to the customary quarter or half circle of the common Cape Belladonna.

The other type of white *Brunsvigia* x *parkeri* has fewer flowers, 7 to 14, and they are more tailored and trumpet shaped, have narrower tepalsegs and are a glistening white with greenish tinge, often showing heavy green ribs on the outside of the tepalsegs. These do have the apricot throat but in less amount and intensity, many times only deep in the throat. A clone from New Zealand falls in this category and it even has a very faint pink blush upon first opening, and again in the faded flower.

I find I can predict the type and color of flower of the Brunsvigias almost the minute the bud emerges. White ones have a very light green bud and stem. Light pink ones have a gray green bud and stem, rose pinks have a pinkish gray bud and stem and the deeper rose and carmine tipped flowers have a very deep grayed wine red bud and even deeper grayed stem. The first type noted above (many-flowered) evidences itself early by an unusually fat bud with a base broader than the stem from which it emerges, almost arrow shaped; whereas the fewer flowered types have long slim buds scarcely larger in diameter than their stems.

So far, I've found the deep colors tend to appear in the smaller flowers and the lighter pinks in larger flowers with wider tepalsegs and

more open faces; but luckily there are exceptions to this and we are breeding more and more of the deeper color into the large flowered types.

The coloring of some of the medium pink and rose-edged flowers begins to blend down into the white throat on the third or fourth day and creates a very attractive effect; sort of a deep glowing rosy light emanating from the heart of the flower.

There are a few heads that open in a full circle, facing in all directions, while many have the pedicels radiating out in the full circle but the flowers tend to open facing Southwest. Of course by far the most of the *Brunsvigia* hybrids have both pedicels and flowers facing in a quarter circle toward the Southwest.

Then there is a whole group of miniatures, very dainty and about half as big as the larger ones, and they include the entire color range of the large ones too. These undoubtedly come from the *Brunsvigia rosea minor,* which I used in my earlier crosses.

I've been trying to make enough observations of the length of the pedicels, to come to some conclusion, but so far, all I can tell is that they tend to bloom with short pedicels, ½ to 3 inches long, which then increase rapidly in length as the flowers mature and fade. Some pedicels reach 8 to 10 inches in length by the time the seed pods form, especially the white forms.

I wonder what nature has in mind for these enlarged heads of seed pods? Might it be to enable the detached heads to blow end over end to distant points to sow their seed, as do some of their relatives growing on the veld of South Africa?

RHODOPHIALA AND HABRANTHUS.—*Rhodophiala bifida*, the Oxblood Lily and *Habrantaus brachyandrus* seem to come up and bloom overnight; so this year I decided to time them. They were in a spot which received no water all summer long; so on September first I gave them a thoroughly deep watering. Sure enough, the next day the tip of the buds of the *Habranthus* and the *Rhodophiala spathacea* (pink) were visible. The third day they were up two to four inches, and on Sept. 4th, the first of the pink *Rhodophiala* and several of the *Habranthus* were in full bloom with secondary scapes appearing four or five days later. The *R. bifida*, oxblood type, took longer to appear and bloomed on the ninth day. This red type is by far the more popular of the two and more easily obtained, but for me, the pink one grows more prolifically, has more blossoms per scape and is even prettier than the oxblood. I have a cross between the two that is just beginning to bloom on taller scapes with a color midway between the pink and the oxblood and with two terminal blossoms on the stalk. This hybrid, which has been made a number of times before by others, has been named *Rhodophiala* x *huntiana* in the present issue by Dr. Traub. The oxblood type will not seed for me except when pollinated by the pink one, but the pink one self seeds readily.

CRINUM — HANNIBAL HYBRIDS

L. S. HANNIBAL, *California*

This group of hybrid siblings is the result of crossing the Orange River Lily, *Crinum bulbispermum* (red-flowered form described by John Barrows in 1801), seed parent, with an F-2 set of seedlings derived from *C.* clone 'Luther Burbank', pollen parents. *Crinum* (Hannibal Hybrids) clone 'Cape Dawn' is the type (see Fig. 21).

Fig. 21. *Crinum* (Hannibal Hybrids) clone 'Cape Dawn' (Hannibal, 1961), as grown by L. S. Hannibal, Fair Oaks, Calif. Reproduced from L. S. Hannibal kodachrome.

Hybrid *Crinum* clone 'Cape Dawn' resembles the hybrid *Crinum* clone 'Louis Bosanquet' quite closely. However, the blossoms are a deep coral pink, are more numerous, and are considerably larger with broader tepals. The cross is very hardy and extremely vigorous. Three year old bulbs are often four inches in diameter and are capable of producing two or three scapes which are 45 to 60 inches long. The scapes normally carry 15 to 20 blossoms in an open type umbel. Since neither of the parents to 'Cape Dawn' are capable of producing offsets it may be that cuttage will have to be employed in order to multiply the bulbs. On the other hand the cross is an easy one to effect and sibling seedlings are remarkably uniform in color and shape. Thus far 'Cape Dawn' has set no seed but some seed has been obtained by backcrossing onto the F-2 Burbank hybrids.

The similarity of 'Cape Dawn' to the pale pink and white flowered 'Louis Bosanquet' leads to the speculation that the latter may be a 'Luther Burbank' cross on *C. bulbispermum*, possibly on the variety *album*, or *blandum* (the Wyndham Hayward weather sensitive pale pink form). Several breeding possibilities with the clone 'Luther Burbank' have been explored and results are particularly encouraging.

X BRUNSERINE

HAMILTON P. TRAUB, *California*

Crosses between *Nerine* and *Brunsvigia* species (= X *Brunserine*) have been reported in the literature. This subject is important in connection with the preparation of the systematic treatise on the Amaryllidaceae as indicating the degree of genetic relationship between these two genera. In order to verify previous reports, and also to add new data, breeding experiments involving these genera were undertaken a few years ago. As examples that involve the extremes, the crosses between *Nerine filifolia* and species and hybrids of *Brunsvigia* are listed in Table 1.

TABLE 1. Crosses of **Nerine filifolia** with species and hybrids of **Brunsvigia.** The crosses between **Nerine filifolia** and **Nerine** hybrids are included for comparison. Pollens of **Nerine** hybrids were kindly furnished by Mrs. Emma D. Menninger.

Seed parent, and 2n chromosome number	Pollen parent, and 2n chromosome number	Number of seeds produced per capsule
Nerine filifolia, 2n=22 *	**Nerine** cl. **'Dunkirk'**, 2n=33	12
" " "	**Nerine** cl. **'Inchmary Kate'** 2n=44	none
" " "	**Nerine** cl. **'Rosalba'**, 2n=?	7
" " "	**Nerine** cl. **'Gaby Deslys'** 2n=22	none
" " "	**Brunsvigia rosea major**, 2n=22	2
" " "	**Brunsvigia** x **parkeri** (Australian group) cl. **'Hathor'**, 2n=? **	11
" " "	**Brunsvigia** x **parkeri** (Australian group) cl. **'Hathor'** seedling, 2n=? **	6

* 2n=24 also reported.
** Not determined, but most likely 2n=22 since all **Brunsvigia** determinations made so far gave 2n=22.

It is of interest to note that when *Nerine filifolia*, 2n=22, was crossed with the triploid, *N.* cl. 'Dunkirk', 2n=33, abundant seeds were produced, whereas when *N. filifolia* was pollinated by *N.* cl. 'Gaby Deslys', 2n=22, no seeds were obtained. When the diploid, *N. filifolia*, 2n=22, was pollinated by the tetroploid, *N.* cl. 'Inchmary Kate', 2n=44, no seeds were produced. In contrast seeds were obtained in all crosses of *N. filifolia* and *Brunsvigia* species and hybrids.

AMARYLLIS GENETICS — 1961 REPORT

HAMILTON P. TRAUB, *California*

In 1953, the writer made the cross, *Amaryllis cybister* ♂ x *A. belladonna* var. haywardii ♀, and the first flowers were obtained in 1956, but due to other duties no record was taken. The bulbs were taken up and potted, and they again flowered in April, 1960.

The bulbs have only a few leaves; are deciduous and go into a profound resting period over winter as in *Amaryllis cybister*. The scape

is slender, reddish at the base and light green upwards. The umbel is 2-flowered as in *A. bellodonna* var. *haywardii*. The spathe-valves are lanceolate, shorter than the 6.5—7 cm. long pedicels. The ovary is green, 1.3 cm. long, 7 mm. in diam. The tepaltube is 1.3 cm. long; the paraperigone closes in throat and is bearded with short whitish bristles. The perigone is almost as irregular as in *A. cybister*, is whitish on the back sides of the segs, and pink on the inner side of the segs which shows that the pink color of *A. belladonna* var. *haywardii* is dominant over the crimson color of *A. cybister*. The pink color is darker pink in the throat. The lower halves of the two side setsegs, and the whole bottom petseg is much lighter pink, showing that the color pattern of *A. cybister* is dominant over the solid color pattern of *A. belladonna* var. *haywardii*. The stamens and style are pinkish; much exserted and the style is longer than the stamens, as in *A. cybister*. The stigma is very shortly 3-lobed, lobes rounded.

Amaryllis × bellabister, Traub, hybr. nov.

Planta inter A. cybisteram et A. belladonna var. haywardii hybrida; floribus rubellis; tube tepalorum brevi; paraperigonio incurvato, cum setis albidis ornato; staminibus styloque valde exsertis; stigma breviter 3-lobato. Holotypus: Traub no. 734a+b (TRA) culto La Jolla, California, 26 Junii 1960.

These results show that it may be fairly easy to obtain the irregular shaped flower type of *Amaryllis cybister* in various other colors by hybridization with other species and hybrids. *Amaryllis cybister* is 4—6-flowered, and most likely scapes with four or more flowers will be obtained in the segregates from selfing the first generation hybrids.

An additional report will be made when the second generation hybrids flower.

[PLANT LIFE LIBRARY, continued from page 75.]

PLANT GROWTH SUBSTANCES, by L. J. Audus. Interscience Publishers, 250 5th Av., New York 1, N. Y. 1959. pp. 553. illus. $10.00. This enlarged second edition of Dr. Audus' comprehensive handbook on plant growth substances will be welcomed. In it the important advances in the subject since the appearance of the first edition are incorporated. After considering the nature of plant growth and its control in general, the following topics are fully treated: the natural auxins; the chemistry of auxins; the mechanisms of auxin action; auxins as general growth stimulants; auxins as initiators of new organs—the rooting of cuttings; auxins as stimulants of cambial activity—use in grafting and wound healing; auxins as initiators and stimulators of fruit development; auxins and the shedding of organs; auxins as growth inhibitors—bud growth and induced dormancy, and general toxicity and use as selective weed killers; various applications of auxins; hormones and reproduction; specific factors for the growth of organs; natural plant growth inhibitors; and growth substances in soil. This stimulating text is must reading for all plant physiologists as well as those interested in the practical application of the information to crop production. Highly recommended.

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

AMARYLLIDS IN CENTRAL CALIFORNIA WINTER-RAINFALL GARDEN

LEO BREWER, *Orinda, California*

Twelve years ago we began an experiment to determine if it is possible to have a large attractive garden in central California which would persist on natural rainfall alone and which would not require much time for maintenance. We have gathered up plants not only from California but from dry-summer areas all over the world.. The acre garden is divided into woodland areas, which are dominated by native conifers; shrubby areas, which are dominated by *Arctostaphylos* and *Ceanothus* along with *Fremontia, Romneya, Dendromecon, Carpenteria,* and many other Californian shrubs; and the grasslands, where most of the members of the Amaryllis, Lily, and Iris families are planted.

Although twelve years is a short time for the slow growing plants of an unwatered garden, the experiment can already be labeled a success if one is willing to tolerate an essentially dormant garden in midsummer. As I must now give up my home and garden in this area and the chance of finding a real gardener who would continue our experiment is not great, this would appear to be the appropriate time to summarize our results to date. This article deals with our experience with members of the Amaryllis family.

To help in the projection of our results to other situations, it might be valuable to define our garden conditions. The garden is three miles east of the center of the University of California campus on the east side of the Oakland-Berkeley hills at 1200 feet altitude. As the hills to the west range from 1700′ to almost 2000′ in altitude, we are shielded from much of the summer fog of the Bay area and our climate is not moderated by the ocean as much as most of the San Francisco Bay area. Our summers are hotter and drier with the temperature reaching 90°F a number of times during the summer and our winters are colder and wetter with the temperature dropping below freezing during most winters. The annual average rainfall is 35 inches, but it is concentrated in the winter and the garden is situated on a knoll from which the rain runs off very quickly. The average rainfall in June, July, August, and September is, respectively, 0.3, 0.02, 0.06, and 0.2 inches. However, these averages are the result of rare moderate rain storms and no rain at all falls in most years. On an average, every other year has a five month drought with less than 0.5 inches of rain. Six month droughts with a total of less than one inch of rain occur on an average of every four years. The real test of such a garden is a drought of eight to nine months with less than one inch of rain which comes possibly once in fifty years. Our garden has successfully weathered one such drought.

The knoll on which the garden is situated was originally part of the natural grasslands with no shrubby plants except for some poison

oak, which was removed. The many oak, maple, and other seedlings which are found each spring are unable to get their roots deep enough to survive the hot dry summer. However, trees and shrubs which were watered during the first summer were able to persist without additional care. Most plantings were made in the late fall so that the winter rains could establish the plants. Mulches were used to retain moisture during the first summer. Most bulbous plants generally received no artificial water even during their first summer.

There are several general remarks about cultural practices that apply to most plants from dry-summer climates. They have not had to develop resistance to fungi which develop rapidly under warm moist conditions such as some of the *Fusarium, Stagonospora, Sclerotina, Ramularia* and especially the widespread *Sclerotium rolfsii* Sacc. Most books advise light soils for dry-climate plants even though they are usually found in heavy soil naturally, but such advice is based on experience in English gardens where the summer rain would quickly bring on rot if drainage were not perfect. Under our central California conditions, most of the plants that we have tried prefer our normal heavy adobe clay soil to any soils which have been lightened by large additions of sand and humus. The heavy soil retains more of the winter moisture through the spring growing season and yet does not promote fungus diseases if the soil is kept bone-dry during the summer. Experimental watering experiments have demonstrated that summer watering is fatal to many of the plants from dry-summer climates.

The next general remark has to do with tender plants. We have concentrated on plants with winter growing habits to take advantage of our winter rain. However, freezing spells often severely damage the winter growth, particularly of many of the South African bulbs. At our altitude we do not experience the severe freezes as low as 15° F which occur in the valley below us, but we can expect 25°F at least every five or ten years. The lowest temperature at our altitude in the last 25 years has been 22°F. These cold spells come during a time of a very cold dry air mass over California. We have observed that exposure to the sky is the most important factor which determines frost damage. Any weeding which removes grass cover causes much greater frost damage. Plants close enough to shrubs or trees which shield a portion of the sky show much less frost damage. If the plants need full sun, they can be planted on the south side of a shrub which will shield them from the night sky.

In the early years, it was our practice to dig in compost and fertilizer below the bulbs. This has been discontinued since it appears to promote fungus growth, tends to cause concentration of root growth too close to the surface, and generally does not seem to be worth the trouble. Many books recommend peat moss. Although our soil is only slightly acid, peat moss seemed to be detrimental to many amaryllids under our conditions. Our present planting procedure is to dig as deeply as possible with a pick and to insert the bulb with no additional soil preparation. Planting depth varies considerably, but generally we

tend to plant deeply, particularly if the bulb is tender, if birds or rodents eat the bulb, or if the bulb is not very drought resistant. Also bulbs which tend to divide too quickly and to become crowded are planted deeply to discourage excessive division. Normally plants are never disturbed once they have been planted.

It is perhaps most convenient to discuss our results with amaryllids by considering related bulbs together. The Allieae tribe has contributed importantly to our garden. Most Allium species are not sufficiently drought resistant to perform well in the grassland areas in full sun. White flowering *A. zebdanense* takes full sun, but *A. cowanii,* which is the showiest white, and *A. neapolitanum* need some shade. *A. triquetrum* grows in full shade here and spreads rapidly. It is delicious in salads and we have to eat it as fast as we can to keep it from becoming a nuisance. *A. tuberosum,* an evergreen onion from North India, also has white flowers and is excellent for salads. Yellow flowering *A. moly* is persistent here on north slopes where the ground does not dry out too soon in the spring. Blue flowering *A. azureum* has been a complete failure here. We have about twenty pink-lavender-purple *Allium* species growing here, but we do not find many of the colors attractive. *A. roseum grandiflorum* and the Californian *A. unifolium* are very attractive here with considerable shade on slopes which retain moisture late into the spring. *A. giganteum* is very showy. The Texan natives *A. drummondii* and *A. zenobiaea* are very attractive here.

One attempt has been made to establish *Nothoscordum,* but it appears to have failed. *Leucocoryne ixioides* has provided us with gorgeous floral displays each spring. The species *Muilla, Triteleia, Bloomeria, Brodiaea,* and *Dichelostemma* play a very important role in the grassland areas. Several were already growing naturally on our land and we have introduced additional species to a total of about 20. They bloom from early March into June. In favorable years the grass is blue with their flowers. Except for *Triteleia lactea* and its lilac variety and for *T. penduncularis,* the others grow in full sun. However, most grew better with either a little shade or a site that did not dry out too soon in the spring. They all do well in heavy soil, even very heavy sterile sub-soil banks. *Bessera* and *Muilla* were tried, but their summer growing habit is not compatible with our conditions and they seem to have been lost.

Both *Agapanthus* and *Tulbaghia* species of the *Agapantheae* tribe have been tried with disappointing results. None of the three *Tulbaghia* species tried will flower without water even in full shade. *A. longispathus* and *A. Weilligii* bloom in partly or largely shaded spots without summer water. Other *Agapanthus* species are established, but they are very slow growing under our conditions. They need special sites of a type that will be discussed in connection with *Crinum* and they may need summer water for several years to establish them more quickly.

Many *Hemerocallis* have been planted near the house where they may benefit from run-off from the lawn. A number of evergreen and early blooming varieties have been planted in the grasslands or in partly shaded spots. They have achieved a good deal of growth during the

rainy months and have given bloom, but their performance has been very inferior to typical garden results. They clearly need more moisture. *Ixiolirion ledebourii* and *I. pallasii* have done well here and the flowers are very attractive.

The *Zephyrantheae* tribe provides *Sternbergia lutea*, one of the most important plants of the grasslands. The bright yellow flowers of many hundreds of bulbs in the fall are an important part of the garden's fall display. The bulbs grow anywhere in the grasslands. *Rhodophiala bifida* and *R. spathacea* grow well also. *R. chilensis* appears to be more difficult and only rarely blooms. *Sprekelia formosissima* and its variety *superba* persists under our conditions, but rarely blooms. It goes dormant during the summer and starts growth after the fall rains. Thanks to the kindness of Dr. Thad Howard, a large variety of rain-lilies (*Zephyrantes* and *Habranthus*) have been planted along our lawn. Each heavy watering of the lawn is followed subsequently by a show of flowers during July through September. A few have been planted where they receive only natural rainfall. Their growth has been much less vigorous, but an unusual heavy rain in May brought forth some blooms and blooming more frequently follows heavy fall rains if they come early. *Sternbergia fischeriana* has not yet been tested in the grasslands, but a test planting near the house gave lovely bloom this spring.

Amaryllis, the favorite amaryllid of most readers, is poorly adapted to our garden. One single bulb is planted where it can receive some run-off from the lawn. It persists, but has never bloomed. However, the other genus of the Amarylleae tribe, *Lycoris*, plays an important role in the garden. A number of these species grow in the grasslands and their fall color is an important addition to the garden. *L. squamigera* has been planted in a variety of locations and persists, but it has never bloomed here. *L. sprengeri* and *L. incarnata* grow and bloom well in the grasslands. *L. sanguinea* has apparently been lost; it may be too tender. *L. radiata* needs shade, probably for frost protection as well as conservation of moisture, to bloom. *L. albiflora* and its variety *carnea* have bloomed well with at least 50% shade. Fifteen *L. aurea* (might be *L. traubii*) have sent up leaves every fall for four years, but they have suffered from frost during the winter and one scape has been obtained in four years.

Narcissus unquestionably dominates the spring garden for almost three months. We have more than 200 varieties and many thousands of bulbs planted throughout the grasslands. The varieties have been carefully chosen to be sun-proof, which has eliminated many large cups and most small cups. Our location appears to be ideally suited for *Narcissus* as representatives of all ten divisions are growing well here. The very late blooming varieties such as the poeticus hybrids, for example, must have considerable shade. Many of the forms of *N. bulbocodium* and other species do well here. The *Narcissus* plantings are divided into two distinct sections which are separated by our house and generally a gap of 20 to 30 feet. Quite a number of years ago, before we had learned to recognize the presence of bulb flies, both the large and small narcissus bulb flies were introduced into the southern

Narcissus section in a batch of bulbs obtained from a local nursery. Although the infestation spread throughout the southern section, it is striking that neither narcissus bulb fly has been observed in bulbs from the northern section. The flies apparently do not travel far. Fortunately, the winds are from the west and never from the south during the time that the flies are on the wing. With the plentiful supply of *Narcissus* in the garden, no evidence has yet been found of attack of other amaryllids except for *Leucojum*. 5% dieldrin dusted around the base of the leaves in March has greatly reduced the infestation. A dusting followed by a spraying of the leaves in April should practically eliminate the flies. If the next owner were to apply the double treatment and follow it with a lifting of the bulbs in August to eliminate any remaining grubs, the infestation could be eliminated permanently. Except to check for fly infestation, the bulbs are left undisturbed. The shoulder of the bulb is covered with 6 to 9 inches of soil to slow down formation of offsets. The bulbs are planted in clumps of one or two dozen with the clumps randomly distributed in the grasslands.

Haemanthus coccineus is well suited to our conditions and never fails to bloom in late August and September. All that it demands is the shelter of some shrub to protect it from the winter sky or ample grass growth around its large leaves to offer frost protection. *H. carneus* has persisted without blooming but the leaves have always been small. It is in 75% shade. *H. catherinae* has been grown as a watered plant, but with no bloom to date. *H. albiflos* goes dormant during the summer and leaves start after the fall rains. Growth has not been vigorous and there has been no bloom.

The *Crineae* tribe provides the very important *Brunsvigia* and *Nerine*. The Californian natives provide ample color in the period November-June in normal years and it is the fall period that needs the most support. Fall color has been provided primarily by *Sternbergia*, *Lycoris*, *Brunsvigia*, *Nerine*, and the fall *Crocus*. The various *Brunsvigia* hybrids do very well in the open grasslands except for frost damage to the leaves during some cold winters. The clones 'Durban', and 'Windhoek' of *Brunsvigia* x *parkeri* (Zwanenburg group), and clones of *B.* x *parkeri* English group, seemed to be the most tender, but the damage is greatly reduced if the grass still overtops the new leaves in late January or if a shrub provides shelter from the winter sky. Several hundred bulbs are planted throughout the grasslands and all available varieties have been tried. Many bulbs have not bloomed yet, but the number of scapes increases every fall and the fall display may some day rival the spring *Narcissus* display.

The *Nerine* must be carefully protected from frost. *N. Corusca major* is very badly damaged in mid-winter if its leaves are not covered by grass or shielded by shrubs. Otherwise its orange scarlet flowers are quite reliable. Some of the *N. Bowdenii* forms put out fall leaves and then go dormant in December whether protected from frost or not. *N. Bowdenii* clone 'Pink Triumph' is particularly valuable for its large blooms on tall scapes up to New Year's Day, but its leaves show frost damage where fully exposed to the night sky. The form 'Pink Beauty'

is similar to 'Pink Triumph'. 'Magnifice' (or 'Magnifica') is an attractive earlier blooming variety. *N. flexuosa alba* does well, but the flower was small and not especially attractive. *N. undulata*, on the other hand, has a small flower but a clump of scapes with pale pink waved tepalsegs is very attractive. A number of other *Nerine* have been tried, but none compared with the best of those mentioned above. Care must be taken not to plant the *Nerine*, especially 'Magnifice', in too shady a spot or trouble is encountered with mealy bug. If shelter from the night sky is desired, the south side of a shrub is preferable.

In the early years of development of the garden plantings were restricted to those plants that had a good chance of succeeding. In recent years less favorable plants such as *Agapanthus*, *Hemerocallis*, *Hymenocallis*, and *Crinum* have been tried. These plants would considerably extend the season of color in the garden and they were worth some effort. The problem was to find a site where they could find sufficient underground water for their late growing season. At first we reasoned that sub-surface drainage would follow surface drainage and that the lower parts of the garden would have sub-surface water later in the season than the higher parts. However, it turned out that the sub-surface drainage did not generally parallel surface drainage. By noting where grass stayed green later in the season and by probing to test the sub-surface moisture content, it was possible to map out those parts of the garden where sub-surface moisture was available late in the season. The planting procedure was to dig as deeply as possible and to lighten the sub-soil with sand and vermiculite. It appears that it may be necessary to water for two summers before the plants are well enough established to carry on without care. As noted above, some *Agapanthus* and *Hemerocallis* have been established; it is too soon to say how generally successful the procedure will be. It has worked well for *Crinum yemense* and *C. 'Ellen Bosanquet'* but both are tender and must be sheltered from the winter night sky. Even with protection, they lose most of their leaves in January, but they still bloom without fail every year. We have about nine or ten other *Crinum* species and hybrids being grown as watered plants which were to have been moved to unwatered sites. *C. bulbispermum* seems to be the most hardy. The others all suffer considerable frost damage even with protection. *C. moorei* is planted north of the house where it receives sun only during the six months that the sun is highest in the sky. Even this small amount of sun appears to be too much during July and August hot spells and it must be watered. It has bloomed the last two years. The X *Crinodonna* is much more like *Crinum* in regard to water requirements. It has not yet been established in an unwatered site.

Leucojum aestivum and *L. vernum* grow well if partially shaded. We have not yet found the proper conditions for *L. autumnale*. *Galanthus* is an important contributor to the garden. *G. nivalis* and *G. plicatus* and their many forms grow best on north slopes or in considerable shade. *G. elwesii* takes much hotter and drier locations. *G. byzantinus* and *G. caucasicus* also seem more drought resistant.

Most members of the *Pancratiae* tribe do not seem well suited to our conditions, but *Pancratium illyricum* blooms consistently in the hottest driest parts of the grasslands. *P. maritimum* grows well but has not been so good a bloomer. *Childanthus fragrans* and *C. ehrenbergii* have been grown as watered plants; their growing seasons do not seem well adapted to our garden conditions.

An attempt was made to adapt the various *Hymenocallis* (including *Elisena)* species to our conditions by changing their growing habits. Len Woelfle had pointed out that these plants are found near the equator and that it should be possible to control their growing season by availability of water. In 1959, when no appreciable rain fell between January and September, all of the bulbs remained dormant through the spring and summer. An unusually heavy September rain brought them out of dormancy. *H. amancaes* grew vigorously until late December frosts. *H.* 'Daphne', *H. caribaea, H. Harrisiana,* and *H.* 'Advance' *also* converted to fall growers. 'Advance' gave bloom in September. However, an unusually heavy rain in May 1960 brought them all back to a spring growing season. It is doubtful if a suitable growing season can be established here. In a garden with higher winter temperatures, it might be possible to convert them to winter growers.

In conclusion, it was found that many amaryllids grow and flower well with only natural rainfall under our conditions. Indeed, quite a number of amaryllids die out quickly if watered in warm weather. Plants of marginal drought resistance can often be successfully grown if provided with some shade. Quite a few amaryllids thrived under our hottest driest conditions and should grow well in even drier climates. The sheltering of tender plants from the winter night sky by shrubs, walls, or grass was found to be of great importance in minimizing frost damage. The mapping of sub-surface water flow appears to provide information on favorable sites for plants with late spring or early summer growing periods. The fall blooming amaryllids can be very effective in remedying the lack of fall color in a typical Californian native garden. Some of the experiments described above are still incomplete. It is to be hoped that the next owner of the garden will be interested in continuing these experiments and perhaps will report the final results in a future article.

WINTER-RAINFALL GARDEN IN SOUTHERN CALIFORNIA

HAMILTON P. TRAUB, *California*

When the writer first settled in southern California, he attempted to have all portions of his garden under overhead irrigation, but he soon learned that certain plants, especially many bulbous plants from South Africa, resented this extra attention, and died out. This led, after such failure, to the making of the winter-rainfall garden which is called also the South African garden since most of the plants grown there are from that region.

In San Diego and nearby La Jolla, the average annual rainfall is about 12 inches, and varies from about 5 inches to 35 inches (in very widely spaced years). In 1958-1959 the rainfall was 6.5, and in 1959-1960 7.5, inches. This rain occurs from October to June, rarely beginning in September. From June to October rainfall is nil or in trace quantities.

In the winter-rainfall garden area, no irrigation is given from June 1 to August 1, and then only in August and September to bring Brunsvigias and Nerines into flower.

The main species now grown in the writer's winter-rainfall garden are *Brunsvigia*, including *B. appendiculata* and the various forms of *B. rosea* (the Cape Belladonna), and various hybrids—*B.* x *parkeri* and *B.* x *tubergenii.* The fall and winter growing Nerines are also planted here, but such species as *N. krigei*, which produce their foliage in summer, are grown in the summer-rainfall garden, receiving a three hour overhead irrigation once each week from June to October.

Landscape gardeners and home owners generally in the irrigated regions of California, Arizona and Texas should investigate the possibilities of the winter-rainfall garden. Attempts to change the arid climate into a humid climate seem to be illogical. It is better to leave the major portion of the garden area as a winter-rainfall or desert garden which receives only the natural rainfall from October to June, and then a special effort can be made to reserve a smaller area which is irrigated in the summer.

Gardeners in the humid regions, with adequate summer rainfall, should not attempt to grow the winter-rainfall type plants in the open ground, but should grow them in tubs. These can be kept in dry storage from June to October, and, from October to June, in the South, can be placed in a protected place, or, in the North, in a window garden or greenhouse, to make leaf growth and flower. In Europe, such plants are sometimes planted outdoors in well-drained soil against a building or wall (southern exposure) with good results. There are some reports from the South that indicate at least limited success in growing such plants in humid areas by planting in *very well-drained sandy soils*, but such results are not generally applicable in humid regions in the South.

AGAPANTHUS AFRICANUS NATURALIZED AT GLADWYNE

Mrs. Mary G. Henry, *Pennsylvania*

For some twenty years *Agapanthus africanus*, sometimes called "Blue Lily of the Nile," has been living out of doors at Gladwyne, seemingly content and happy. I planted three bulbs in the springtime on the north side of a deeply imbedded rock, so they would have a cool root run and also to help conserve moisture.

They were planted in a slight depression so I could water them efficiently, not often, but only in an extra dry spell, maybe once or twice a summer. As the ground slopes gently the drainage is good.

The bulbs were planted in good clay loam which was rather stiff so I mixed in a little sand before planting them. They were set not much below the surface. The first winter I protected them carefully. About six inches of leaves were piled over them and on top of them I lay a piece of cello-glass, on the four corners of which stones were laid to keep it in place during winter storms. This is my usual method of protecting "doubtfully hardy" bulbs during their first winter. It seems worthwhile to spare no pains in protecting bulbs or plants for a year or even two years. After that period I feel they should fend for themselves, and if they cannot "take it" they are free to die in peace with no protest from me, merely regret.

The background is of large, deciduous trees in front of which are hemlocks, broad-leaved evergreen shrubs and deciduous Rhododendrons.

Fig. 22. *Agapanthus africanus* as naturalized at Gladwyne, Penna., the estate of Mrs. Mary G. Henry.

While the *Agapanthus* do receive a lot of sunshine in the afternoon, the backdrop of shrubbery shades them until well along in the morning.

In summer when the weather becomes hot and dry I sometimes dig in a top dressing of old leaf mold. Once every few years they have a few handfuls of Vigoro scratched in. During some winters they receive no care whatsoever and all of our winters are cold ones, near zero, to zero and below zero.

These *Agapanthus* have done well, really, with remarkably little care or attention. I could almost say they have thrived on neglect. The three original bulbs which I planted about six inches apart have now

increased to well over thirty. This year there are a number of self-sown seedlings around the clump. [Fig. 22]

The flowers of *Agapanthus africanus* are of a beautiful medium-deep blue, with about thirty-five good sized flowers in a head held on strong, but slender, stalks about two feet tall. The blooms come when they are greatly needed, about July 20th. At that time my new race of late-flowering Azaleas is just coming into bloom. The twelve feet tall Azaleas, *Rhododendron gladwynense*, blanketed with their pale salmon-pink flowers, are directly behind the brilliant blue Agapanthus. The effect is wonderful. Each enhances the beauty of the other.

GROWING AMARYLLIDS IN MICHIGAN

DONNA N. SCHUMANN

As with many amaryllid devotees, our interest began with inexpensive *Amaryllis* hybrids. We lived in Cincinnati at the time and soon discovered that placing plants outdoors during the summer months not only relieved the windowsills of the rather large-sized pots but also greatly benefited the plants.

After several years of growing *Amaryllis* hybrids successfully and being filled with awe each time one of them bloomed, we decided that here was a group of plants that warranted more interest. So we began adding a few "foolproof" *Zephyranthes* such as *Z. grandiflora*, *Z. citrina* and *Z. candida* to our summer garden plantings. The little plants produced their pink, yellow and white blossoms readily and thrived nicely during the long growing season in Cincinnati (mid-April into October).

As our interest grew so did our variety of amaryllids. Len Woeffle, who lived only a few blocks from us, not only willingly answered some of our questions and gave us growing hints but also parted with some of his plants to be added to our collection.

Then, in the fall of 1957, we moved to Kalamazoo, Michigan. Half-heartedly we dug and packed our bulbs. This, we expected, could be the end of our amaryllid hobby, except for those which could be treated as houseplants. Our stock, at this time, consisted of our Ohio grown plants as well as some lovely new species which we enthusiastically received from Mrs. Clint of Brownsville, Texas. These plants were all from Texas and several areas southward. Needless to say, we were very apprehensive about growing them in Michigan.

However, we optimistically planted our various amaryllis, *Zephyranthes*, *Habranthus*, *Cooperia*, *Ismene*, *Hymenocallis*, *Crinum*, and *Chlidanthus* the following mid-May hoping that an unexpected frost would not destroy our efforts. But everything grew! Everything bloomed! We were delighted!

Most of the bulbs were planted on the south side of the house close to the foundation where they were exposed to the sun for the entire day. The soil, which is usually a hard-packing black loam, was loosened by the addition of spagnum peat moss and sand. During the frequent brief dry

spells which are common here, the plants were watered regularly. Blooming during the dry periods was much reduced in spite of watering, but after a day or more of summer showers the plants would burst forth with many dainty flowers.

When freezing weather threatened during the latter part of September, we lifted our bulbs and stored them for another long winter.

TABLE 1. Degree of success in growing various amaryllids in Michigan. See text for methods of culture.

1. GROWTH OBTAINED BUT NO BLOOMS TO DATE

Chlidanthus fragrans	**Zephyranthes** x **ruthiae** clone 'Ruth Page'
Zephyranthes flammea (**Pyrolirion flammeum**)	**Zephyranthes** sp. (collected by Prof. Nelson in Panama; near to **Z. puertonicensis**)

2. GROWTH OBTAINED AND LIMITED BLOOM

Zephyranthes drummondii D. Don (syn.-**Cooperia pedunculata**)	**Habranthus brachyandrus**
Zephyranthes brozosensis (syn.-**Cooperia drummondii** Herb.)	**Habranthus cardenasiana**
Zephyranthes citrina	**Habranthus robustus**
Zephyranthes insularum (Clint-M-741)	**Sprekelia formosissima** "var. superba"
Zephyranthes macrosiphon	**Sprekelia formosissima** "from Chandler"
Zephyranthes smallii (syn.-**Cooperia smallii**)	
Zephyranthes sp. (Clint; "Valles")	

3. GOOD GROWTH AND GOOD BLOOM

Crinum clone 'Cecil Houdyshel'	**Hymenocallis** (subgenus **Ismene**) **narcissiflora**
Crinum x **powellii** var. **album**	**Zephyranthes candida**
Hymenocallis harrisiana	**Zephyranthes grandiflora**
Hymenocallis (subgenus **Ismene**) Clone 'Sulfur Queen'	**Zephyranthes** sp (Clint M-375)
Hymenocallis (subgenus **Ismene**) clone 'Advance'	**Zephyranthes** sp. (Clint M-292) (syn. **Cooperia**)
Hymenocallis (subgenus **Ismene**) Clone 'Pax'	

4. HARDINESS TEST (OUTDOORS)

(Planted within 33 inches of house foundation, south exposure).

Crinum x **powellii** var. **album**	**Zephyranthes candida**
Crinum clone 'Cecil Houdyshel'	**Zephyranthes grandiflora**
Zephyranthes sp. (Clint M-375)	

Crinum clone 'Cecil Houdyshel', *C. powellii album* and *Zephyranthes candida* were left in the garden for hardiness tests, since they are said to be somewhat hardy. Apparently they were sufficiently protected by the house foundation and an ample snow cover since they have now survived two normal winters. A few *Z. grandiflora* and *Z.* Clint M-375's

lived through last winter. A planting of *Z. candida* in an open garden away from the house was, however, unsuccessful.

Our stored bulbs were planted again last May and grew and bloomed rewardingly. We had an extra bonus from them last fall when after a cool, rainy period in early November we discovered a profusion of bloom from *Habranthus brachyandrus, H. cardinasiana, Zephyranthes candida, Z. citrina, Z.* Clint M-292, and *Z.* Clint M-375. All bulbs, except the Crinums and *Z. candida* hardiness test bulbs, were lifted and stored after this display of flowers.

The bulbs have now been planted for a third summer in Michigan. Most of them appear in good condition and many of them have multiplied well so that we can expect even more lovely flowers than before. The only bulbs that have failed to survive in storage were of *Zephyranthes rosea.* Another attempt will be made with new bulbs.

Apparently amaryllids can be grown successfully during a much shorter and cooler summer than they are naturally accustomed to in their native habitats.

In the accompanying summary the growth and blooming qualities of our various amaryllids are indicated. It is hoped that such information will encourage other growers to try more varieties of amaryllids in the northern parts of the country. See Table 1.

BRUNSVIGIAS IN NORTHWESTERN LOUISIANA

Caroline Dormon, *Louisiana*

Several years ago I obtained Brunsvigia rosea minor from J. N. Giridlian. I planted it in coarse gravelly sand, mixed with leafmold, about five inches deep. The site is well drained, as I live on the side of a sand hill.

The first two winters, the leaves were cut down by severe freezes, and no flowers followed. I concluded that the latter was the result of the former. When cold weather was predicted the next winter, I turned a bushel basket over the clump of leaves, then threw a tow sack over that. This light protection was sufficient, and the leaves were not even nipped back.

The latter part of August I was richly rewarded for this small attention—a mass of flowers appeared. There were seven stems in one small clump. The flowers were not large, but clusters were full. The color was soft rose, tipped with bright blue—a lovely combination.

For two winters I have followed this course, and on two Augusts have been rewarded with flowers. In 1959 the temperature dropped to 16° F. one time, in 1960, to 19°. Lower temperatures might wipe them out, but I shall hope not.

HAEMANTHUS CARNEUS AND H. NELSONII

L. S. Hannibal, *California*

One of the interesting features of collecting amaryllids is that on unexpected occasions one encounters some very pleasant surprises. This has been particularly true with the bulbs of *Haemanthus carneus* Ker-Gawler and *H. nelsonii* Baker. I first encountered *H. carneus* while rambling about in the shady portions of Cecil Houdyshel's interesting garden. The two inch bulb had a pair of small semi-elliptical leaves covered with a fine white fuzz, giving the plant an appearance quite similar to the little *H. albiflos* var *burchellii* which I have grown for many years. So, concluding that the plants were probably similar, a bulb was purchased for breeding purposes. A small hybrid adaptable to a three-inch pot would make an interesting foliage plant and an occasional dish mop like red blossom would add to the oddity.

Fig. 23. *Haemanthus carneus* as grown by L. S. Hannibal, Fair Oaks, Calif. Reproduced from L. S. Hannibal kodachrome.

However when a flowering umbel finally arrived [Fig. 23] and opened fully it was quite an unexpected surprise, as the flowering head is quite distinct from all of our better known *Haemanthus* species such as *H. katherinae* or *H. coccineus*. The flattened six-inch high scape carries some 30 to 45 small pink blossoms on two-inch long pedicels in an open cluster. The small yellow anthers are rather insignificant—The pastel pink tepalsegs and tepaltubes predominate giving the umbel a rather dainty appearance. The blossoms open at random over a period of ten days and last for four or five days.

Seeds set rather readily and ripen within six weeks. The seed coatings remain unpigmented and thus fail to turn scarlet as in *H. coccineus* and other species with which I am familiar.

Haemanthus nelsonii can be readily confused with *H. carneus*, however the umbel is more compact and the anthers more prominent. At least that is the description given of the typical form. The bulb pos-

sessed by the writer had the anthers sunk so deep in the throat of the blossoms that they were nearly invisible and the tepalsegs were colored a pastel pink.

Haemanthus carneus probably represents a relative primitive form of the genus. The blossoms are more typical of the basic blossom of the Amaryllidaceae and the anthers have not taken over the bizarre arrangements as found in the other species. *H. carneus* is listed and illustrated in the booklet on Protected Wild Flowers of the Cape Province. We can conclude that the species is none too plentiful, but since it grows to an elevation of 4000 feet it is fairly winter hardy. The seeds sprout quite rapidly when planted on a moist loamy potting mix, but since only two leaves are produced each year it takes four or five years to obtain bulbs of flowering size. The color range is not fully known, but appears to extend from a near white to a deep coral pink. The blossoms are ideal for a small corsage.

SMALL-FLOWERING AMARYLLIDS IN THE LOWER GULF COAST REGION

Claude W. Davis, *Louisiana*

The numerous species of bulbous plants which include *Zephyranthes* and *Habranthus* have very appropriately been given the group name "Rain Lilies", because they bloom after a rain in the wild. Bulbs of about three dozen species were planted in the fall of 1958 on the bluff land at Baton Rouge, Louisiana. The soil is a silt loam of the soil series classified as Olivier with a pH of 6.4 to 6.6 During the summer of 1959 summer rainfall was frequent and heavy,—almost daily at times. The mature bulbs bloomed freely and a heavy crop of seed was set on the fertile species. The following season, 1960, a very severe drought was experienced in the entire region with very little rainfall in the months of May through July. The beds were not watered and as a result practically all species became dormant with neither flowers nor foliage. Rains commenced in early August and within a week most of the species were flowering and putting out new foliage.

My interest in these small-flowering amaryllids was stimulated by the plant hunting expeditions of Mr. and Mrs. Morris Clint of Brownsville, Texas, into the prairies of Texas and down into Mexico, as reported by Fred B. Jones in Herbertia 1956 and by Kitty Clint in Herbertia 1957 and 1958. My attention was also called to the fact that Dr. Thad H. Howard, Jr., of San Antonio, Texas had been making similar plant collecting expeditions and had built up quite a treasure-trove of species and varieties which were new to horticulture. Both Dr. Howard and the Clints generously shared some of their "finds" with me and this article is in the nature of a report of performance here in the Lower Gulf Coast Region of these native bulbous plants of Texas and Mexico, plus a few other species acquired from other sources. In the Clints' nomenclature an "M" indicates Mexico and a "T" indicates that the plant was collected in Texas.

All of the small flowering amaryllids grown here appear to be perfectly winter hardy in this region. Freezes are infrequent and of short duration and it is very rarely that the temperature drops as low as 20 degrees. All of the species grown appear to do well in full sun and all respond to a fertile soil, high in organic matter and an abundance of moisture during the spring and summer months.

Zephyranthes grandiflora, from Mexico, is the largest and most commonly grown of the rose-flowers species. The bulbs form offsets freely and the increase from this means is rapid, but the flowers appear to be sterile. The white *Z. atamasco* which is native from Virginia to Florida has been a failure here, although the writer has seen it flourish at the home of Caroline Dormon in the sandy-clay coastal plains of North Louisiana. *Z. candida* is a white flowering form from Argentina and Uruguay with blooms coming in mid-summer to late summer. It does not set seeds, but offsets freely. The leaves endure through the winter months. *Z. citrina*, M-449, *Z. smallii (Cooperia smallii)*, T-56, a larger form of *Z. smallii*, *Zephyranthes* sp. M-550 and *Zephyranthes* sp. 'Valles' are all of some shade of yellow from a light straw yellow to a deeper color. These yellow forms seed freely, but the increase from bulb division is very slow.

Zephyranthes drummondii (*C. pendunculata)*, a native of Texas and Clints' M-292 are large white forms. The latter is a light seeder, but gives a very satisfactory bulb increase.

Smaller forms of collected white rainlilies which have done well here include *Z. traubii (C. traubii)* which is found in the coastal prairies between Corpus Christi and Houston, Texas and *Z. brazosensis (C. drummondii)*. There are several variations of the latter, depending on the locality where found. Two which have done well here are Dr. Thad Howard's 'Stars' from North Bexar County, Texas and one from N. W. Bexar County, a less desirable form. This latter variety is white tipped with pink on the reverse. Another form of *Z. brazosensis* which has done well in Baton Rouge was collected by Dr. Howard between Cuidad Valles and Tamazunchale, Mexico.

A very excellent "Rain Lily" for this locality is Dr. Howard's *Z. ruthiae* Clone 'Ruth Page' which he described in 1958 Herbertia (page 55) and which is again discussed in more detail in 1959 Herbertia by Dr. Traub (page 35) and by Dr. Howard (page 85). 'Ruth Page' is a selected seedling of a cross of *Zephyranthes rosea* and *Z. citrina*. This extremely vigorous clone is a deep "shocking pink" in color. The size is intermediate between *Z. rosea* and *Z. grandiflora*. Increase is very rapid from vegetative offsets.

The large pink rainlily, *Zephyranthes macrosiphon*, has been successful here. It was collected by Mr. and Mrs. Clint under the number M-30 in Mexico near El Sol, San Louis Potosi. Increase is both from seed and from offsets.

M-20, the dark red *Zephyranthes clintiae*, is a fine garden subject. It is described in Herbertia 1952. Associated with it in the same locality

are several other forms which seem to be so closely related botanically that Mrs. Clint has dubbed them "the clintiae complex". One of these, M-25 is an extra large, dark pink. Other collected pink *Zephyranthes* which have proven their worth here are M-22, a bright pink with a white streak, M-410, a deep pink with a white throat and M-375, a pale flesh pink with a deeper color on the reverse. Not to be overlooked is the small and dainty *Zephyranthes* sp. collected by Prof. Ira S. Nelson in Panama and distributed to the members of the Louisiana Society for Horticultural Research as the "Panama Rainlily". The color is a light lavender-pink.

Habranthus are another group of the small-flowering Amaryllis which share garden interest equally with the *Zephyranthes. H. texanus* is bright yellow on the inside and burnt orange on the reverse of the flowers. It is a native of Texas, but appears to be equally at home in the silt soils of this area. Increase is from seed and bulb offsets. *H. brachyandrus* is a large lavender with purple at the base of the flower. A sterile hybrid form. *H.* x *floryi* is a large pink which flowers well here, but has made no increase. The Clints' collected form *H.* sp. M-445 is a pink similar to *H. robustus*, with flowers 2" across the face and up to 2½" long. *Habranthus robustus* is a large, pale pink which grows vigorously and flowers well. Vegetative increase is slow, but the plant seeds freely.

By far the most startling discovery and introduction on the part of Mr. and Mrs. Morris Clint was their collection M-456 in the state of Guanajuato, Mexico. This was later recognized as a new species by Dr. Traub and given the name *Habranthus immaculatus*. This is a magnificent and stately white species with flowers 3½" across the face, borne of 14" scapes. It is described and illustrated by Mrs. Clint on pages 17 and 18 of Herbertia 1957. Growth is very vigorous and the bulbs are immense, up to 3" in diameter, but the increase, alas, is extremely slow.

SOME GOOD NEW DAYLILIES

GEORGE GILMER, *Virginia*

There are many fine varieties of daylilies that I have never seen and others that I have not grown. My comments are confined to recent introductions growing in my own garden. All mentioned have been highly praised by garden visitors.

In 1959 Dr. Traub introduced fifteen tetraploids. I bought two of the less expensive, 'Captain Reid' and 'Reverend Traub.' As small plants this year , they did so well I recently bought two more.

'Captain Reid' is like 'ALAN', but a little better on a smaller, younger plant. 'Reverend Traub' is the purest, brightest golden yellow I have seen and repeats. I believe there would be a tremendous demand for them if they sold at the same price as other introductions. I have given this space to tetraploids because I am expecting big things from them in the next few years.

Dr. Traub's diploids are priced in line with the introduction of other breeders. His 'Winged Victory' is a lovely yellow. 'Junipero Serra'

is a lovely yellow blend. I also have his ''George Gilmer', but will not comment on it, lest someone think I am partial because of the name.

'Lyric' is a good garden pink.

'President Rice' is a fine large golden yellow. 'Alan' is one of the best reds.

'Flying Saucer' and 'Joan Durelle' are good yellows. 'Molle Gloye' is a beautiful bi-color of soft pastels.

'Chetco' is a fine new yellow. 'Pink Lace' is a pink that is near white.

'First Orchid' is an interesting color break. 'Gene Wild' is Lester's best. It comes early and repeats. It is a yellow blend. 'Kings Ransom' is one of the newest and best melon pinks.

'Alice Russell' is the most beautiful yellow and pink I have seen. 'Cartwheels', is one of the largest and best of the new yellows. 'Miranne Russell' and 'Lucille Russell' are fine garden pinks.

'Green Shadow' and 'Tenth Anniversary' are two of Sass' best.

Mrs. Taylor introduced 'Colonel Fry' last year and 'Crimson Challenge' this year. They are two of the best reds. 'Highland Fling' and 'Bridal Wreath' are two lovely pastels with harmonizing eyes. 'Sun Down' made perhaps the best display of any single plant in my garden in 1960.

There are a lot of other new ones that are about as good as these mentioned above. It is just remarkable how the hybridizers keep on bringing out something better year after year.

I have arranged the plants under the alphabetical order of the breeders, except Dr. Traub's. His new ones are such a break they are put first.

SHIPPING HEMEROCALLIS PLANTS

Hamilton P. Traub, *California*

Losses have been reported when daylilies have been shipped even by air mail in recent years. Thus it would appear that the shipping of *Hemeracallis* plants should be standardized.

The *Hemerocallis* rootstock is a pseudo-bulb, that is, a near bulb. It is a thickened stem portion surrounded by leaf-bases, but evolution has not proceeded as far as the true bulb where the living thickened leaf-bases that surround the stem remain intact for a considerable time and serve as storage organs. Thus the *Hemerocallis* plant, with the leaves trimmed to 3 to 4 inches may be treated somewhat as the bulb.

A good friend of mine on the Atlantic seaboard, who sends out strong *Hemerocallis* plants, digs and air-dries them, and places them in a cardboard box and mails either by ordinary mail or express. Plants sent in this summer have always arrived in excellent condition. The important detail is to see to it that there is no moisture to initiate decay.

The writer uses the above method when strong plants are sent. However, when single fans are sent, especially if they have been separated shortly prior to sending, they are air dried, the roots are placed in a plastic bag with a small amount of vermiculite to take up any excess moisture. It is important not to place a great excess of vermiculite in the plastic bag since this may cause additional drying of the plant. The plastic bag may be sealed off with a rubber band above the roots.

Plants placed in plastic bags without air-drying and sealed off with a rubber band or string at the pseudo-bulb level have arrived here by air mail from the Middle West with the lower portions of new roots decayed (mushy), and entire decay (mushiness) of the old roots. Sometimes, such plants may be salvaged by removing the decayed parts and carefully planting the remains in pots. It may also happen that such plants are too far gone and cannot be salvaged.

RHODOPHIALA X HUNTIANA

William Lanier Hunt, *North Carolina*

The hybrid between two Miniature Argentinian Lilies, *Rhodophiala* x *huntiana*, that Dr. Traub graciously named for me (Plant Life 17: 1961), that is the subject of this note, makes seeds so late (Sept.—Oct.) that these should be planted in a flat in the greenhouse. However I have planted several crops of seeds of the "oxblood" red form of this beautiful little hybrid out of doors. As soon as they were ripe, I simply scratched out a spot in a good flower bed, scattered the papery seeds and raked them lightly into the soil as one does with grass seeds.

A light covering of pine needles over the beds has been all the protection from the on-coming frosts that my seedlings have ever had. Usually, quite a crop of tiny hair-like green threads comes up at once, and apparently many of these succumb to winter. It may be a good thing that they do not all grow, for, from each of the yearly beds, it seems, a never-ending crop of bulbs has come. Every year, the beds of flowers which have long since taken over the seed beds must be cleared of Miniature Argentinian Lilies. *Rhodophiala* seeds all come up at once, but this experience reminds me of the beds of gladiolus seeds I had when I was a child; they would keep coming up for seven years.

I tried unsuccessfully for years to get *Rhodophiala spathacea*. This "pink" species is advertised at a high price. They were always "lost" or "out", so I never got any. Now, however, perhaps as many as 1 percent of the seedlings that keep coming up have turned out to be pink—what might be called "shocking pink", in two shades. Actually, they are near to the Horticultural Colour Chart's rhodamine purple (HCC-628/2). The stock of *Rhodophiala bifida* (oxblood form) that we have in the United States is self sterile, and *R. spathacea* (purple) is self-fertile and is cross-fertile with *R. bifida*. Thus, the fertile forms that I have are apparently segregates of hybrids between the two. This cross has been made by others, and Dr. Traub has named it for me as already indicated.

Rhodophiala seeds are very perishable. As soon as the papery black seeds are beginning to shatter, scatter them over the surface of a seed box or bed and sprinkle soil lightly over them. A light mulch will help to preserve the moisture and speed germination which takes place very quickly. In colder sections above North Carolina, a greenhouse or at least a frame is necessary to protect the evergreen seedlings the first year. After that, the little bulbs will pull themselves down into the soil to the level they like best.

THE DIMINUTIVE AMARYLLID, CRYTANTHUS

CLAUDE W. DAVIS, *Louisiana*

Cyrtanthus are an intriguing small-flowering Amaryllis of easy culture in the garden where the winters are mild and, indoor as pot plants in cold climates. These narrow leaved, bulbous plants have small, umbellate flowers on scapes which may vary from 6″ to 2 feet in length, depending on the species. The tubular flowers of the Henry Hybrids, *Cyrtanthus* x *henryae* that I have been growing, are approximately an inch in length and are colored white, cream yellow, pink or bright salmon. Stamens are inserted in the tube of the corolla. The tepaltube, or tubular portion of the perigone, is generally enlarged toward the apex of the flower and the tepalsegs above the tepaltube are usually shorter than the tepaltube.

Culture should be the same as that used for Amaryllis under the same climatic conditions. Flowering frequently occurs in the late winter, which makes open culture somewhat unsatisfactory in regions which normally have mild winters, but which occasionally experience a light freeze in late winter or early spring. Under these conditions the foliage of the plants is not affected, but the flowers are ruined.

Cyrtanthus seed freely and are easily grown from seed. The seedling bulbs may easily be grown to flowering size in two years if given good culture under conditions which permit optimum growth during the winter months.

These diminutive plants from South Africa do not produce the spectacular show of color which one finds in the hybrid *Amaryllis*, but they are charming and relatively inexpensive to acquire, easy to grow and propagate and make an interesting addition to the flower lover's plant collection.

ANOTHER FINE NEW LYCORIS

WILLIAM LANIER HUNT, *North Carolina*

In 1951 and 1952, I was fortunate enough to purchase some imported *Lycoris* bulbs. When they first bloomed on August 26th, 1953, they turned out to be nearly white, with tiny red lines on the tepalsegs and ever-so-faint a hint of peach. After they were fully opened, they were an off-white, very delicate and beautiful. The foliage came along tardily; not until after that of *L. radiata* (old sterile form) i.e., in late

September. Tardy foliage in middle North Carolina is apt to get frozen back. This is what happens to ultimately destroy *L. aurea*. However, the leaves on the new bulbs came sooner than those of *L. aurea* and were mature enough to take the November frosts in stride.

When the bed of improved bulbs began to flower yearly, I noticed, one day, right in the midst of the patch, a marvelous light greenish yellow blossom, quite different from the rest. By Wilson's Colour Chart of the Royal Horticultural Society, it turned out to be Dresden Yellow 64/3—a shade that one finds almost nowhere except on certain fine china.

This outstanding flower was a great deal fuller and heavier than the airy blossoms around it, and so Kodachrome records were made of it in

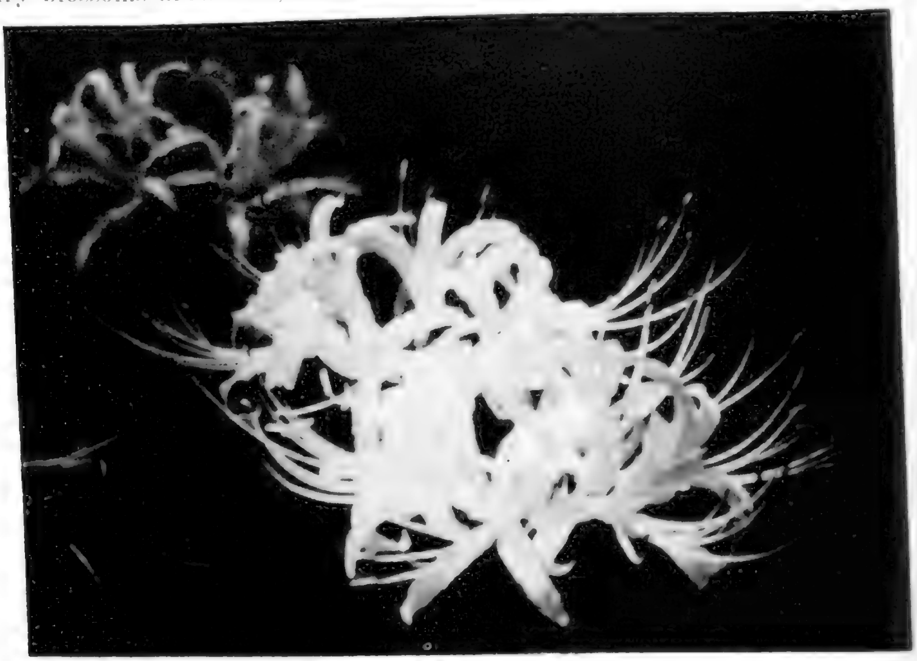

Fig. 24. *Lycoris* Sp. (Dresden yellow-flowered, with fuller, heavier flower), in foreground; and *L. houdyshelii* in background. Grown by William Lanier Hunt Chapel Hill, North Carolina.

its prime and in different stages of opening from year to year. After fully opening it turns to the faintest creamy white. When one inspects the bed of flowers, one's eye lights immediately upon it because it is fuller and heavier than its companions.

In 1957, Kodachromes and specimens were sent to Dr. Traub by air mail. He identified the flowers from the new patch of lycoris as *L. houdyshelii* and the strange new one as something as yet unknown. I am sure that he will describe in Plant Life. Since no black and white photographs were ever made of this flower, and the Kodachromes are inadequate for this purpose (see Fig. 24), we shall have to wait another year to publish a good picture of it.

The heavy winter snows of 1960 seem to have prevented the normal flowering of lycoris in general this year. Foliage was not evidently damaged, but the formation of flower buds seems to have been. *L. squamigera* has flowered only about 2 percent, and the early fertile clone of *L. radiata* has done a little better: perhaps 10 percent. The bulbs of the new lycoris had not awakened on the last day of August, but watering brought out three buds by September 10th. Perhaps the approaching hurricane, ''Donna'' will bring forth more buds. One bulb of the newcomer is to be sent to Dr. Flory and one to Dr. Traub, and it looks as if we may have another very, very fine new lycoris for Southern and West Coastal gardens.

AMARYLLIS IN THE MIDDLE WEST

Mrs. Fred Tebban, *Illinois*

Here in Illinois this 1960 growing season is a fine one with plenty of heat and moisture which amaryllis need and all my plants grown in pots are putting up fine husky foliage. The seedlings I find it necessary to grow in beds are also doing well, although our growing season here is so short they must be planted late and harvested early so it takes them a long time to reach blooming size.

The potted plants were grown indoors under fluorescent lights for several months and then were placed outside in partial shade on the south side of the house in early May. It was necessary to cover them only once as protection against frost, and I shall leave them out as late as possible in the fall, although it is generally necessary to bring all potted amaryllis inside soon after Sept. 15th because of threat of frost. Most are forced into dormancy then but a few of the slower ones are allowed to grow again under light inside.

Before placing the amaryllis outside I used muriate of potash as a fertilizer in solution (one teaspoonful to a quart of water) and watered the growing amaryllis with this a number of times to induce strong, stalwart foliage to withstand wind damage after placing outdoors. I find that this is an excellent practice to follow for those of us who must use the indoor-outdoor method of culture for since using this fertilizer I have been able to move the amaryllis outside without the loss of a single leaf from wind damage. In the 1959 Herbertia, Mr. Douglas D. Craft of Chicago, refers to a ''Tomato Food'' he uses on his amaryllis. I was able to obtain some of this ''Tomato Food'' which has an analysis of 3-12-13, and have used this in solution also, to feed the potted amaryllis. I have used this in the same strength as the muriate of potash, one teaspoonful to one quart of water, and am very well satisfied with the results of its use. I have also used as a starting solution an ''Alaska Fish Emulsion'' which is slightly higher in nitrogen content but very good to get leaf growth started. However, it is better to use outdoors rather than inside due to the very fishy odor, although it is advertised as odorless. These fertilizers, together with liquid manure, are fed in rather

larger amounts than would be used if our growing season were longer. I find it wise to fertilize pots at least once a week as fertilizers leach out with frequent waterings. Those grown in beds are not fertilized quite so often, as some dry fertilizer was placed in the beds and worked in to insure a good supply in spite of rainfall and frequent waterings.

To each pot this year I added a generous supply of charcoal to keep the soil from becoming too acid. Frequently red spots appear on the foliage and one can know then the soil is too acid for the liking of the bulb, and a small amount of horticultural lime must be added to bring it back to a more neutral condition. Due to the use of the charcoal, thus far no red spots have appeared and all the amaryllis appear to be in a healthy condition. I have dusted them occasionally with a chlordane dust, and water once in a while with a DDT solution, to discourage insects in the pots, although we have few insect pests other than cutworms and sowbugs that are harmful. There are no fungus diseases or viruses to fight unless we receive infected bulbs, and each new bulb should be segregated until it is found to be free of all such ailments. I have often found bulbs with thrips between their scales and occasionally mealy bugs, but these I have gotten rid of quickly by dusting the bulbs with Semesan. I have found this most useful too in counteracting decay that may be caused by too much watering or too cold temperatures. Here our greatest two enemies seem to be acid soil and cold below 50 degrees, for the amaryllis dislike temperatures below 50 for any length of time.

I have purchased during the last two or three years a number of the hybrid *Amaryllis* bulbs, grown in South Africa, which have shown up on the markets and am very happy to find them equal to the Dutch Hybrids in every way. They bloom in late October or early November when first purchased but I am wondering if this cycle of growth will change and they will bloom at the same time as the others after being grown in this northern hemisphere. Only time will tell.

I still find that I have many failures among the various bulbs of *Amaryllis* species, but always hope for better luck another year.

Each year I try to add a few new bulbs to my collection, and this year am ordering 'Bouquet', 'Apple Blossom' and 'Delilah' from Ludwig's. I have long striven for a good orange and a good black-red among the various shades of color, but have found neither of these so far among my purchases. Maybe I shall someday be able to produce these shades in seedlings of my own crosses when I live in a climate more adapted to amaryllis growing.

COMMENTS ON THE 1959 — 1960 AMARYLLIS SEASON

ROBERT D. GOEDERT, *Florida*

The 1959-60 season was marked by abnormally heavy rains in many sections of the south and a very late spring. The flowering season was erratic and many spikes that came up early were damaged by the cold. This reduced the quality and number of spikes at the various shows. I did, however, have a number of letters from amaryllis fans who had exceptional results and I feel *Amaryllis* gained many new friends this past season.

I believe generally that the largest number of complaints this season was about short spikes. I think short spikes are caused by the bud starting and then suddenly being retarded or stopped by a prolonged cold spell. If the cold condition is for a sufficient length of time the bulb will often become dormant and the bud will not develop when the bulb starts to grow again.

This season I observed quite a few beds of amaryllis in the Jacksonville area. Most of the best flowers were in beds in protected areas and particularly on the west side of the buildings or walls. I believe the ground in these areas has a more constant temperature and the bulbs remain dormant until the weather is more settled. I found where the beds were on the east side of buildings or out in full sun growth started in many cases a month earlier and many spikes were damaged by cold spells.

With the wet season just past I believe many of us in the south will admit that generally one plants his bulbs too low. I am adding coarse sand to many of my beds and raising them several inches before re-planting. I think we should pay more attention to seeing that an open textured soil is used for our amaryllis beds and that they are well drained. Water should drain away from them and not pond so the soil gets soggy or muddy. Most soils can be improved by adding sand, perlite, peat, manure and leaf mold. Remember that in most regions of South America where amaryllis are native the country is mountainous and not like our flat Southern Gulf States and Atlantic Seaboard. There are some species that grow on a precipice and even in trees. If you can plant your amaryllis on a terrace or slope it would be well worth trying.

This past season was marked by other difficulty besides the weather. One Dutch firm shipped a considerable number of bulbs through a southern port to avoid the possibility of freezing which had occurred the season before. Many bulbs came in sprouted. Part of this was due to heating in transit and to the fact that shipping schedule to the southern ports from Holland takes several weeks longer than to northern ports. Though this was a noble experiment it did not appear to be the answer to receiving bulbs dormant and in top condition. The Dutch firms are constantly striving to furnish bulbs in top condition. Last season they also experimented in a small way by starting their green-

houses a full month earlier so they could ship before cold weather sets in. The results looked good and this season many bulbs will be shipped early. It is hoped this will improve considerably the condition of the bulbs received by the customers. Most bulbs however will again be shipped through northern ports to reduce shipping time.

This coming season there will be a larger number of new amaryllis clones introduced by the Dutch Growers. Notably these will be from three firms: Ludwig, Warmenhoven, and Van Waveren.

The Van Waveren new clones sound interesting. They are listed as follows; 'Christmas Dream', orange scarlet; 'Decora', carmine rose; 'General Eisenhower', salmon; 'Haarlem', red; 'Orange Beauty', orange; 'Poussin', wine red 'Rose Beauty', cyclamen rose; 'Rosy Cloud', pearl pink.

Both Ludwig and Warmenhoven showed in the Floriade or World Flower Show. The Ludwig firm won a gold medal first prize. The Warmenhoven strain won the Prix D'Honneur for the stand that had the best and most exclusive and attractive display. They also won the Gold Medal First Prize for outstanding quality of flowers and large range of clones. It is most gratifying to see this firm introduce five (5) new clones at this show. It is also fitting that with the Floriade this year the Ludwig firm should introduce a larger number of clones than usual. It also would be expected that the new introductions from these firms will be most noteworthy. It will also be noted that three of the Warmenhoven clones are a departure from the solid colors. This may point to a new trend in Dutch Amaryllis—to more of the stripes, two tones and blends. This will be a welcome change in my opinion.

The new Warmenhoven clones will be quite high in price this year, and since they are scarce, will possibly remain high for several years. The new white 'Snow Queen', is said to be a huge flat faced variety with faint green throat. It may prove to be the largest white. 'Golden Triumphator' is a large light salmon orange with greenish throat. The upper tepalsegs of this clone have a violet stripe. 'Orange Wonder' is a light orange blending to dark orange in the throat. 'Floriade' is a most interesting clone—a white with a soft pink sheen; the lower tepalsegs being pure white; the upper tepalsegs have two dark lines in each. As the clones tend to have more color in this country it may turn out to be more striped than the description indicates. 'Elvira Aramayo' is a light violet with very large flower. From early indications this clone will be much sought after. Only those ordering early in 1960 will be able to get it. It is a color many desire and should become very popular.

Ludwig & Co., introduced a number of clones at the Floriade that will not be made available to the public until stocks are more plentiful. Their two picotee type clones are 'Petticoat' and 'Square Dancer.' Others are 'Alpine Splendor,' white; 'Sleigh Bells,' white; 'Dutch Belle,' rose; and 'Peppermint,' a striped clone. They all sound most interesting and will be welcome additions when available.

Ludwig's seven introductions for the 1960-61 season consist of four (4) large-flowering clones and three (3) gracilis types. The four large-

flowering kinds are. 'Symphony,' a delft rose said to be an improved 'Diamond;' 'White Favorite,' a slightly bearded late white; 'Belle Vista,' a cherry red; 'Flora Queen,' a spinel pink with dark veining. I have been told that Ludwig & Company has great faith that 'White Favorite' will be one of the top whites for a number of years. Their three new gracilis are 'Pixie,' orange with pointed petals; 'Pamela' capsicum red with green throat; 'Voodoo,'' scarlet with white green throat. The Gracilis are lovely pot plants and should be grown more extensively.

The Van Meeuwen firm offers one new clone this season. 'Verona' is a salmon pink with white throat. There are few amaryllis in this coloring so it should be a welcome addition.

Reports from last season's new introductions have been light, however, of Ludwig's clones 'Spring Dream' and 'La Forest Morton' have caused the greatest comment. 'La Forest Morton' is a very good violet rose clone that should become very popular. 'Spring Dream' is apparently a free flowering salmon pink. This is a departure from the rose pinks that have predominated. 'Ludwig's Ace' is similar to 'Spring Dream' but with more of a salmon orange tone. 'Prima Donna' is an old rose, a new color about which there is a mixed opinion. After it is better known this color may be accepted with more enthusiasm. It is a different shade and is a worthwhile addition to any amaryllis collection. 'Christmas Gift' did not get wide distribution. The public seemed to go more for the older proven whites. This is partly due to the fact that new fan's first Dutch amaryllis is usually a white. Often they have seen a white clone they want. 'Christmas Gift,' after one season's growing appears to be a worthy addition to the white class. It is fairly large, slightly ruffled, and sweet scented as it grows for me. It should prove to be a good clone. 'Circus,' Ludwig's new dark red and white variety is similar to 'Candy Cane' but darker. It did not cause much comment. Another year will give a better picture of its worth.

'Purple Queen,' Warmenhoven's new dark purplish red clone of last season, was fairly popular the first season. I have heard mixed opinions on it. Some say it is in their opinion the outstanding dark red. Of course some were disappointed that it was not a true purple. I feel it will be many years before we have the true purple. 'Pink Beauty' was grown by only a few fans. It appears to be a large free-flowering clone. It is different from any other clone—red and white veined with a general tone of pink. It has the same veining effect as 'Sweet Seventeen' but possibly more so. It can apparently be grown large and should make a good show clone.

Van Meeuwen's new clone of last season that caused the greatest comment was 'Zenith.' This unfortunately was poorly described and many were disappointed in it. Others did not let the poor description alter their opinion of it and considered it one of the best striped red and white varieties yet introduced. It is a large bearded red and white

striped flower with the lower tepalsegs near white. In Holland I understand that the lower tepalsegs are often pure white and the red color more rose. I am afraid we can not depend entirely on the color description made in Holland especially on the striped clones.

If one will realize that Holland is on a latitude equal to Canada and that we in the Gulf states of the United States are on a latitude with Northern Africa one can readily see where some variations in color might be expected. In Holland the springs are marked by heavy fogs, when here usually the skies are clear. The sun's intensity has a lot to do with the color shades of amaryllis. In Holland the colors are usually much lighter than here. In the striped clones the striping appears pink or rose, when here it appears red. 'Zenith' should become one of the leading red and white striped clones.

Van Meeuwen's pink 'Queen of Sheba' and 'Queen of the Pinks,' appear to be very free flowering rose pink clones, possibly a little darker than Ludwig's older, 'Pink Perfection.' 'Queen of the Pinks' flowered much larger for me than 'Queen of Sheda.' Both appear to be good additions to this color shade.

The clone 'Camellia,' unfortunately, was very scarce. It is said to be practically double. The bulb I had was damaged by cold so I did not see this clone. It seems to be more tender than others. It may be a hybrid of one of the double species that are more tender and do not flower well when disturbed.

Last season the new "Hadeco" strain from South Africa was introduced. These come in separate colors. Although all colors were not true they did prove to be at least 80 to 90% true to color shade. I had reports of flowers up to 12" and many said they were some of the darkest reds they had ever seen. The pink and rose shades turned out mostly striped red and white and pink and white. They appear to be very free-flowering. Flower size is good and they are worthy additions to the amaryllis list. They can be flowered early as they are dug in July and August and are available from September to March. This firm expects to offer named clones in the near future and surely they will have many worthy ones.

The amaryllis received from India this past season were very interesting, however there is still a need for improvement in uniformity and proper classification. The bulbs I received from the Universal Bulb Company were most desirable.

The Dutch Strain from Universal Bulb Co. in separate colors were an improvement over those received the season before and of fine quality. Many were equal to named Dutch. I had several in a lot of about 200 that were outstanding. The Dutch Strain I received from L. K. Pradham appeared to be a mixture of Dutch, half Dutch, Australian and other hybrids. Many showed the characteristics of the species, amaryllis. Some were of the *A.* x johnsonii type. In several hundred I flowered many were culled but I found some outstanding flowers among them. They surely would not be accepted by customers in the U. S. as of the Dutch strain. The colors were only partly true

as labeled. They possibly were classified by the color of the seed parent. There were a number of most interesting types in them but one has to buy a hundred bulbs to get a fair assortment. I found some interesting bronzy orange colors, a number that had the lower tepalsegs specked with small dots of color, a rose with large yellow green throat that appears yellow at a distance, and a large orange and white about 12" with twisted tepalsegs. I would say this is a grab mixture and if one likes to gamble on a 100 to 1 shot this would be an interesting venture.

The Australian hybrids I received from Universal Bulb Company this past season were much improved over those received the year before. They appeared much like a selection of the bulbs sold by L. K. Pradham as Dutch strain. In fact I had several that appeared to be identical in both lots. The Australian hybrids were only fairly reliable to color but the colors and forms were most interesting and different. The whites were all near white, however there were a few pure white that were most interesting. One had a yellow tone with large green throat. One would have to buy some quantity of these bulbs to get a good picture of this strain. If these hybrids were properly selected they would be an excellent addition to any amaryllis collection.

The miniatures from L. K. Pradham and Universal Bulb Co. were much alike but those from Universal were a much better selection. They range from *amaryllis belladonna* hybrid types to flowers similar to the Dutch Gracilis. They also contain some near *A. johnsonii* and other types. They were a "Dukes Mixture" if there ever was one. Those from L. K. Pradham had a higher percentage of Belladonna hybrids in them. Of those from the Universal Bulb Co. I found some most interesting miniature in the striped red and white and pink and white sorts. They appear to be hybrids of several small species.

The Gracilis from Universal Bulb Co. appear to be a more select cross than the miniatures. Most were orange red and very pretty. They appear to be a cross between Dutch Gracilis and the Belladonna hybrids and possibly other species and hybrids. Their growth is much different from that of the miniatures being much smaller and less vigorous. They are definitely different. The Gracilis from L. K. Pradham turned out mostly to be of the Indian Belladonna hybrid type and a small scarlet and white hybrid or species and a few other hybrids.

Few of the miniature doubles from the Universal Bulb Co. flowered but those that did were small—about 6" tall—with a double flower similar to the double form of *Amaryllis belladonna (albertii)* but much smaller. They do not grow well until warm weather and those left out last season perished due to cold. They are more tender than the others and can only be grown in the open in areas with a very mild climate.

The amaryllis sold in India as "Equestris" is a miniature scarlet with yellow green and white throat. It is plentiful and makes a very nice pot flower. It has been determined as a hybrid of *Amaryllis belladonna*. It is an interesting and worth while hybrid.

From the amaryllis examined from India it can be said that there are many interesting sorts raised in that area. There appears to be

no standard of quality or type, and anyone ordering can not be sure what he will receive from the different bulb dealers and growers in that country. It is hoped this can be corrected so that a more reliable source of better types can be had.

The amaryllis is definitely on the move to a more prominent place in the southern garden, as a show flower, and as a pot plant in all parts of the United States. We find, besides the Dutch, competing in this market, growers from South Africa, and India. As this competition becomes keener it will necessitate an even higher standard in quality.

While South America has been slow to recognize the value of the amaryllis as an ornamental plant interest is beginning to show in some areas. This interest will surely grow and it is expected many new species will come out of South America in the next few years.

COLLECTING AMARYLLIS SPECIES

JOSEPH C. SMITH, M.D., *California*

Another year has gone by and many things have happened in the world of amaryllis. New and exciting F_1 and F_2 hybrids of species have been reported on by the Louisiana Society for Horticultural Research. Ludwig's tenth anniversary catalogue offers new color patterns in the hybrids. Dr. Cardenas of Bolivia has supplied a number of persons and institutions with seeds of *Amaryllis* species and crosses that he has made. Mr. Goedert of Jacksonville, Florida, has imported more unidentified species from Brasil. Thus, many of us have been able to add to our growing collections of *Amaryllis* species.

An unidentified *Amaryllis* species being grown by a number of collectors as *A. forgetii* since its introduction from the Andes several years ago by Dr. Goodspeed has been temporarily placed as a form of *A. correiensis.* This classification may yet have to be changed pending further study due to its summer flowering habit, whereas, the true correiensis flowers in spring. This is not as attractive a form of *A. correiensis* as the type. Its value to the breeders lies in its summer flowering habit which along with the fall blooming *A. aulica* could be expected to extend the flowering season of the hybrids. This species was described in the 1956 Herbertia under title of "An Andean Amaryllis Species."

Amaryllis barbata has been reintroduced from Suriman by a California enthusiast. The writer has identified *A. barreirasa* among bulbs received from Prof. Nelson via Dr. Cardenas. This form has somewhat narrower tepalsegs than the one originally described from Barreiras in east central Brasil. Since Dr. Cardenas collected this bulb in Bolivia this would indicate a wider range of *A. barreirasa* than has been previously reported.

Amaryllis species imported from India as "equestris" have turned out to be a nice near *A. belladonna* hybrid. It makes a very nice show with its bright scarlet color when planted several bulbs to a pot. [See

Amaryllis x *mostertii* described elsewhere in this issue.] The double form offered by the Indian growers is also a very nice miniature. The hybrid of *A. reticulata* var. *striatafolia* 'Mrs. Garfield' is also available from India. *A. stylosa* received from the same source did not bloom so has not been positively identified.

Mr. Robert Goedert of Jacksonville, Florida, has imported at least four batches of unidentified *Amaryllis* species from the states of Santa Catarina and Paraná, Brasil which he is offering for sale. To date none of these have been positively identified but from the foliage at least one could be a nice miniature species. Mr. Goedert will no doubt have other species in the future as his collectors are successful in locating them. The writer has received of *A. calyptrata* from central Brasil. This one is said to be a light green in color with deeper green netting and pink stamen. From the same area bulbs of *A. aulica* have been received which no doubt will prove different from those from Santa Catarina reported upon in the 1960 Amaryllis Year Book.

Amaryllis bulbs received from Mrs. Every, of Chrispeen, Saba Islands, Netherlands Antilles bloomed well and were pretty much like those pictured in the last year book with Mr. Jones article. His came from the same source as Mrs. Every is quite liberal with her *Amaryllis* bulbs to those who buy some of her excellent needle work. These are probably mostly early hybrid forms.

As far as it is known to the writer stock of the newly described species, *A. fragrantissima*, as described on page 32 of year's book by Dr. Martin Cardenas has not been sent to the United States as yet. Dr. Cardenas has been exceedingly helpful to American collectors by making available to us seeds and bulbs of the species native to his country, Bolivia. Last year he sent seeds of the newly relocated species, *A. viridiflora*, as well as a number of crosses of species he has under cultivation. It is hoped he will continue to provide this type of service in the future and make available seed of the pure species so that we may have early wide distribution of these in this country. In his article on searching for the green flowered *Amaryllis* species he mentioned seeing *A. crociflora* growing in the wilds. We hope he can supply this one this year.

One of the highlights of the past year has been the first flowering of a new *Amaryllis* species imported from Bolivia in 1957 and collected there by Dr. Howard Smith then on missionary work in Peru. This is not an exceedingly beautiful species being a shade of brick-red in color. Its really outstanding feature is its extremely short tepaltube, the shortest yet described in an *Amaryllis* species. It will flatten the "pansy-faced" hybrids even more when it is bred into the hybrid lines. For practical purposes you can say it almost has no tube at all. The tepalsegs are formal and the two flowers face slightly above horizontal. The plant is quite robust and easy of culture. The leaves are rather long and can be distinguished by their rolled edges. The first flowers went into the Traub Herbarium so it is not known whether it will seed well to its own pollen.

Another highlight of this season has been the report of a new species from Argentina, *A. parodii* (Fig. 25). This one has greenish-yellow long trumpeted flowers and belongs in the Macropodastrum group. Bulbs have been promised and seed have been received and started. This is a very exciting new addition to the available *Amaryllis* species.

Fig. 25. *Amaryllis parodii* (Hunz. & Cocu.) Traub, native to Argentina; flower with long-trumpet, and greenish-yellow in color. Reproduced from Trab. Mus. Bot. Univ. Nac. Cordoba, 2 (no. 7), 1959.

Many other leads on *Amaryllis* species have been run down, and a number of bulbs have been obtained that have not flowered as yet so will have to be reported on later. Actually, instead of getting closer to having in collection all of the *Amaryllis* species, we get further from the goal as new species are discovered and many of the long described ones remain unavailable. There is a great likelihood that there remain many more species in the wilds of South America, and we can look forward to many more years of discovery of new species to work with and enjoy.

FIRST STEPS IN AMARYLLIS GROWING

MRS. VICTOR MCGEE, *Costa Mesa, California*

Having seen our first Dutch Hybrid *Amaryllis* in bloom in a southern California nursery in 1945, my husband and I were unable to forget its beauty and huge size.

Although the first few domestic bulbs purchased were a disappointment, in 1955 I sent to Holland for six bulbs, which came in December. They were planted in a mix of garden loam, peat, leafmold and sand with one tablespoonful of bonemeal and one teaspoonful of blood meal per six-inch pot.

Soon huge buds began to show and in 8 to 10 weeks they began to flower in my living room, later being shifted to a lathhouse which is covered with plastic on the top in the winter.

As they bloomed, we began to hand pollinate the flowers (not knowing that newly rooted bulbs should not be used for seed-setting.) In spite of this, we have over 1,000 seedlings in the backyard, of which about half should bloom this spring (1960). The fifteen or so that bloomed late in summer of 1956 were some lovely selfs in coral, pink, salmon and reds. This bed has had a ground rabbit manure mulch and the bulbs are completely covered with soil. A large percent of these seedlings already have a ring of offsets around each one.

Each winter I add a few new bulbs from Holland. Two years ago 'Candy Cane' and 'White Giant' failed to root, so in May I quartered the bulbs, covered them with Vermiculite and now I have two lovely 'Candy Cane' bulbs; but 'White Giant' failed to produce any bulblets. Of the twenty potted bulbs we have, only 'Ludwig's Dazzler' has produced an offset.

In another bed I have what I believe are "American Hybrids", purchased from a lady nearby, who grows them. Some blossoms are 11″ across and they multiply rapidly.

Last spring I found a maggot like worm in the scales, causing rot. I lifted all these bulbs, a few at a time, and soaked them in a semesan solution for one hour, dusted them with chlorodane and soil sulphur and replanted them with ½ of the bulb above the soil, which I had lightened with sand and peat. Our soil is adobe and alkali due to water supply. Recently I found several of the bulbs dead, roots completely rotted off.

In 1959 I had flowers constantly from January 14th to October 7th from my bulbs. Now I am anxiously awaiting the results of my newest bulbs; one of them is the rare 'Cerise' (Warmenhoven).

AMARYLLIS NOTES, 1960

C. Lloyd Burlingham, *Florida*

FLOWERING.—In 1958 I bought *Amaryllis* seeds from Ludwig, 100 white strain and 100 rose strain. The seeds were sown on receipt, and the resulting plants were grown next to each other under similar conditions of heat, light, moisture and feeding. Less than two years later (May 10, 1960) three of the white strain bulbs had blossomed. One bulb was 2½ inches in diameter, with two offsets (each 1⅛ inch in diameter) on April eighth when I repotted it. Another bulb that blossomed was also 2½ inches in diameter, with two offsets. The third bulb

that blossomed was 3 inches in diameter, with no offset. Curiously in the same lot was a 3 inch bulb with two offsets that did not blossom, as well as a bulb 2¾ inches in diameter with no offsets. None of the rose-colored bulbs blossomed when the flowering season ended for this spring (1960). Incidentally, these seedling whites had beautiful 7-inch flowers which I prefer to the usual early whites.

I have read somewhere that the secret of *Amaryllis* flowering is feeding, that if one grows the bulbs large enough, they will surely blossom. This is of course an exaggeration. I have had plenty of 3 and 4 inch *Amaryllis* bulbs which have skipped a year.

In making my Mead cross H-1 x 11-1, I used for the seed parent a bulb with a 7-inch medium red blossom, but with a white blotch near the edge of one tepalseg. The pollen parent had a 6-inch dark red flower with no white. Of some thirty resulting seedlings, only one showed any white, and that was a near-white. The flowers ranged from six to seven inches, and were all dark red, (except for the one near-white), not covering a white range except for No. 18 (the 18th of the cross to bloom), which was extremely dark, perhaps the darkest *Amaryllis* I have seen. It is darker than 'Alcyone'. I did not have a 'Tristan' in blossom for comparison. The extremely dark red was not evident in the seed parent, and was not evident in the two preceding generations of the pollen parent. Where did it come from? Thus the parents must be heterozygous, possessing both genes for white and red flower color. Red is apparently dominant over white, and when red was present in double dose in the offspring, the seedlings were red-flowering. In the one case, genes for white-pattern were apparently present in double dose and this gave rise to the near-white.

Occasionally an Amaryllis blossom will have eight, ten, twelve or more tepalsegs. But seeds from such plants will seldom produce bulbs that produce flowers with more than the normal number of tepalsegs. Thus these unusual forms are not due to heredity.

FEEDING.—We all know that *Amaryllis* are voracious feeders. I have found that *Zephyranthes* are no more abstemious. *Hymenocallis* grow nicely here in sandy soil without fertilizer or care. But I potted a small offset and found it takes kindly to an amount of fertilizer that would kill a lot of plants.

ADAPTABILITY.—Last year, because of unsuccessful crosses, I had quite a few bulbs of *Amaryllis* to discard. I removed the soil, which I wished to retain, from the roots and tossed the whole plant into the high grass. We had an unusually heavy and prolonged rainy season in the summer. This year I find that a lot of them took root where they fell, and have been blossoming as happily as if they were still in their pots.

RESULT OF A CROSS.—One year I had a 'Red Master' bloom very late. I wished to use the pollen in a cross, but the only blossom I had available was a Mead Strain bulb (#16-1). It was a dark red, although not my darkest, and had a flower only 5½ inches in diameter. I did not expect all the flowers of the resulting seedlings to have flowers

twelve inches in diameter, as 'Red Master' was advertised to produce. I thought some of them might be only eleven and a half inches. The seedlings that matured and blossomed, less than a dozen, had seven-inch flowers. In some cases the color of the flower of the seedling was a little darker, not much, than that of the Mead parent, and sometimes there was no change. I had supposed that in a cross the darker red would be dominant over the lighter red.

EXPERIENCES WITH AMARYLLIS

B. W. Homfeld, *California*

I started to grow Amaryllis about eight years ago. A friend gave me a pound coffee can filled with seeds that she had raised in her yard from fine Dutch hybrid *Amaryllis*. Thus I got started on an interesting project which has expanded into more than a hobby. However, before I write about my experiences with *Amaryllis*, it is important to say something about the locality, soil and climate.

We live in the southern part of the San Joaquin valley, about thirty miles north of Bakersfield. The summers are hot and dry; the winters are quite cold and damp. During the summer the temperature is mostly above 90° F. Once in a while it goes up to 110° F. We seldom have even as much as a light shower from early May to the last of September, and all the water that the *Amaryllis* bulbs receive in summer is from irrigation water. The soil is a sandy loam, quite easy to work if it is not disturbed while it is too wet. Winter is our rainy season—last year we had a total of a little over three inches. The frosts are quite heavy, the low during my experience was +17° F. What we lack in rain we receive in "pea soup" fog that fills the valley for much of the time in winter. This should give you a fair picture of what we have to contend with.

I was lucky because the seeds that I started with came from the best Dutch *Amaryllis* hybrids available at the time. I obtained a good stand of seedlings. I had purchased *Amaryllis* bulbs before my first seedlings bloomed but my own seedlings really awakened my interest in breeding these plants. Even now after having produced thousands of blooming seedlings, I still get a real thrill from watching the new ones bloom. [Fig. 26]

At first I planted the seedlings in part shade, with the bulb about half above the soil level, but the sun could injure the bulb in the summer, and frost could cut down in winter. Thus experience taught me that the bulbs should be planted more deeply in this locality. After the shaded location was used up, I started to plant the bulbs about 30 inches apart each way quite high on ridges with about one and a half inches of soil over them. This keeps the frost from injuring the bulbs in the winter and the sun from "cooking" them in summer. The important thing as I see it is to keep the bulb growing during the hot weather so that it can get off to a good start in the fall when the weather is cooler

and more favorable. When the temperature rises to 108°-112° F. it requires a lot of water to keep the bulb from going dormant. I believe that if the ground gets too dry, the bulbs will be retarded.

In my experience, the bulbs are best transplanted from early spring until August without too much of a setback, but after that date, they may go dormant and the fall growing season is lost.

Fig. 26. Hybrid *Amaryllis* seedling grown by B. W. Homfeld, Wasco, Calif. Reproduced from B. W. Homfeld kodachrome.

During the past spring when the bulbs were in full bloom, I sold many. In this way the buyers could select the colors that appealed to them. The bulbs were taken up with a little soil and wrapped in a plastic bag. All were surprised how well they withstood the transfer from one garden to another.

As fertilizer I use lots of cow manure. *Amaryllis* are heavy feeders and require lot of it, which is spread between the rows and worked into the ground with the tiller.

I have derived much pleasure from showing the blossoms that I have during the off months of June, July and even August. The blooms in part shade (Fig. 27) are usually better in color. Blossoms that are in the hot sun fade pretty badly. There are at least a half dozen blooms in the garden now (July 26, 1960), and that is after at least 10 days of at least 104° F. weather.

Fig. 27. Mrs. Emma Lou Homfeld admiring Homfeld Hybrid *Amaryllis* seedlings; spring 1960. Reproduced from B. W. Homfeld kodachrome.

All in all I derive a lot of pleasure in finding out how to grow bulbs in this locality so that they will bloom well and multiply. I believe that the largest bulb that I planted last season was over seven inches in diameter.

I hope that my experiences may assist others in the San Joaquin valley and others living in a similar climate, to grow *Amaryllis* successfully.

CONTROL SUGGESTED FOR AMARYLLIS SPOT *

Three things generally are necessary in the control of red leaf spot disease of *Amaryllis,* according to Dr. D. B. Creager, head of the Plant Board's Pathology Department. In a report on this fungus-caused infection, he suggests sanitary practices, preplanting bulb treatment, and fungicidal sprays.

An important disease of *Amaryllis,* red leaf spot frequently is referred to as red blotch, red fire and rust, and is called leaf scorch on *Narcissus.* This ailment appears first as small red spots, then grows larger to form dead areas with red borders and brown to gray centers. The tips of affected leaves die back, often as far as the top or neck of the bulb.

A suitable sanitation program demands the removal and burning or burying of all dead and severely affected leaves, plus all dead leaf debris scattered among the plants. Crop rotation should be practiced in commercial plantings.

Bulbs soaked for two hours just before planting in a solution of one-half gallon of commercial formaldehyde and 100 gallons of water should reduce the bulb-borne phase of the pathogen.

The amount of leaf spot on plants can be reduced significantly by sprays of Zineb or Ferbam. Applications should begin when the foliage is small and continue until blooming.

AMARYLLID CULTURE

C. L. BURLINGHAM, *Florida*

Amaryllis x *johnsonii*—It is said that *Amaryllis* x *johnsonii* thrives in clay soils in south Texas, but in south Florida it does very well indeed in sandy soil in full sun. Some one has suggested that since this hybrid originated so long ago, and has been grown under such different conditions, some deviation might have occurred. I procured three bulbs of *A.* x *johnsonii* from Texas, and could see no difference in their flowers from those of the sort usually grown in south Florida. However, Mrs. Carl Shirley, 1540 Forsythe St., Beaumont, Texas, believes she has found a deviation in a bulb somewhat smaller than usual, with leaves not over twelve inches tall, with scapes still shorter. The flowering differed in having narrower, much recurved tepalsegs. Mrs. Shirley admits that the size of the bulb and plant may have been influenced by the fact that she found it growing in "black gumbo", which gets brick-hard in summer.

USE OF FERMATE.—Some years ago I received a shipment of *Clivia* heavily infested with crown rot. In some way I learned that the answer was "Fermate", though I had no information as to how to apply it. I sprinkled the powder generously into the crowns of the plants. None of the treated plants survived. Later a correspondent informed

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* Reprinted from Florida State Plant Board Bulletin, Vol. 2, page 4, January, 1960.

me that I should have used a weak solution; that the treatment would have killed, even if the disease did not.

Later still, I received a shipment of three Dutch Hybrid *Amaryllis* bulbs, damaged by cold. By the time I realized anything was wrong, two of the bulbs had completely rotted. In the third I cut a wedge, past the center, from top to bottom. I realized that my bulb was finished as a bulb, but it had an unrooted offset one inch in diameter, which I wished to save. I had had some difficulty previously in rooting offsets even in sphagnum moss. I cleaned off the rotten tissue as well as I could, and left the bulb with offset attached on a bench in the shade to dry. Next day I found it had not dried, but continued to rot. I cleaned up the bulb again, and applied Fermate generously to all cut surfaces, the powder quickly forming a paste. In 48 hours I washed off the Fermate under running water, and planted the bulb with offset attached in potting soil. Six nice bulblets were obtained. When it came time to repot, because the six bulblets were crowded in a six-inch pot, I could not determine, by size or otherwise, which was the offset I had fought to preserve.

Amaryllis belladonna L.—It is generally known that *Amaryllis belladonna* L. (forma *major)* as grown in Florida is usually self-sterile. It may also be inter-sterile. On a dozen flowers I tried the pollen of 'Tristan', a dark red Dutch hybrid, without success.

Amaryllis striata.—I have two forms of this species. One is a six-inch flower, light salmon in color, with long narrow tepalsegs. The other has a modern red five-inch flower, with shorter, wider tepalsegs, which usually overlap more than half their lengths, though there may be some variation even on the same scape. Out of curiosity to see if I could get a satisfactory form of *Amaryllis striata* with a dark red color in 1959 I used the pollen of 'Gypsy Girl', a Ludwig dark red "Gracilis" not yet generally introduced, and in 1960 the pollen of 'Tristan', a dark red Dutch hybrid. The results from this cross are eagerly awaited when the seedlings flower.

GERMINATING SEEDS IN VERMICULITE

Leo Brewer, *Orinda, California*

In the 1958 Herbertia, L. S. Hannibal reported a method of germinating seeds in sealed plastic containers containing vermiculite which would appear to be a boon to gardeners who do not have sufficient time to keep seed beds watered.

The method was tested on a variety of seeds of both bulbous and nonbulbous plants and was also used for cuttings. In place of rigid plastic food containers, polyethylene freezer bags were used. One to two inches of vermiculite was put in each bag, water added, and the excess drained off. The seeds were sprinkled on top of the vermiculite and the top of the bag was folded over and sealed with a paper clip, which also held the identification tag. The bags were stacked in a large carton which was kept in a dark cool spot until leaves sprouted.

When seeds sprouted during the fall and early winter, the seedlings were often transferred directly to either seed beds or most commonly to their permanent site. The roots can be easily extracted from the vermiculite without damage. A sharp probe was used to make a hole deep enough to accommodate the two to four inch roots. The seedling was inserted and the hole filled with vermiculite. The top of the hole around the base of the seedling was filled with soil to hold the seedling upright.

Seedlings which sprouted in late winter or spring were allowed to grow in the bags which were taken outside and stored in a box in the shade of a tree which prevents overheating of the bags by the sun. The long length of the plastic bags allowed ample room for the leaves. Bulbous plants such as *Nerine* went dormant during the summer and the bulbs were picked out in the fall and planted outside. Evergreen plants such as *Iris douglasiana*, *Iris innominata*, or *Iris tenax* retained their leaves all summer. As the plants received no nutrients, growth was not excessive and the plants could be kept alive in the bags until the fall rains had started and the plants could be set in the ground.

There are several details to note. No effort was made to securely seal the bags. In some instances, there were holes in the sides of the bag. The increased water loss through small holes seems to be negligible compared to the water content of the vermiculite. The bags were checked usually once a month and water added if necessary. Seeds were carefully cleaned as it was found that mould often developed if parts of seed pods or stems were mixed with the seeds. When it was planned to grow seedlings through the summer in the bags, the vermiculite depth was often increased to four inches and fewer seeds were added.

Most amaryllis and iris seeds germinated well at an average temperature of 50-60° F. A few seeds refused to germinate without chilling. For example, *Iris tenuis*, which gave zero germination even after a year, gave over 50% germination after several weeks chilling of the bag in the refrigerator and then returning to the higher temperature.

Another valuable use was found for the vermiculite bags. Many of the Pacific Coast native iris are very difficult to transplant as they are deeply rooted and it is impossible to dig deeply enough to preserve the root tips. If they are planted out in the sun immediately after lifting, they will wilt away even if watered. If the plants are sealed in a bag for two to three days and kept in the shade, sufficient root tips are regenerated to sustain them after replanting in the open with a high survival rate. This method works well whether the soil is retained around the roots or whether it is washed away. During spells of low humidity when it did not seem safe to put them out, the plants have been kept in the bags for several weeks without harm. The leaves are normally left outside and the bag sealed with a rubber band around the base of the plant.

The polyethylene bags were also used to pre-germinate seeds of annual and perennial plants that are normally broadcast. The plan was to scatter the seeds just before they were ready to germinate and just before a fall rain storm. Unfortunately, there was no rain from October

to Christmas last year and the seeds had to be scattered out when they showed signs of germinating. The yield was much smaller than usual; the pre-germinated seeds appear to be more susceptible to drought. However, in normal years, this procedure should insure a greater germination yield and should give the seedlings a better start on the grasses and other competitors.

A GIANT LATE HOOP-PETTICOT DAFFODIL

William Lanier Hunt, *North Carolina*

The old orange *Narcissus bulbocodium conspicuus* used to be a rare plant in gardens in the Southern States. It was a great favor if the

Fig. 28. *Narcissus bulbocodium* Giant Late Hoop-petticoat form as grown by William Lanier Hunt, Chapel Hill, North Carolina. Reproduced from W. L. Hunt kodachrome.

owner agreed to give you a few bulbs. Today, it is still very scarce, but it is not as early or as beautiful as the light yellow forms of *N. B. citrinus* which we can now buy from bulb dealers.

In middle North Carolina, the temperature drops as low as two to four degrees below zero F. for a few hours in the middle of the night during the last week of the year and the first week of January. During late December, the buds of *N. B. citrinus, N. B. romieuxii* have already begun to show, the daytime January temperature, which is most often just above freezing, gradually tempts these buds into bloom. There are, during this period, between three-fifths and one-half sunny days, and the sun awakens the small flowers of *N. B. citrinus* and *N. B. romieuxii* in frozen condition every morning. Their resistance to freezing is amazing. I have taken several colored slides to show how they last from one to two weeks in the garden in spite of it.

Of course, by the opening of the year, *N. B. monophyllus* has long since bloomed and gone—usually well before Christmas and sometimes at Thanksgiving. In January and February, various other hoop-petticoats fill the winter with their charms, and the season had always ended, in my experimental garden, with the old *N. B. conspicuus.*

Some years ago, however, I received from one of my bulb dealer friends in this country, a little batch of fifty "*N. B. citrinus*". They were planted in a mixture of chip dust, gritty clay and some bone meal on a little slope to the South. When foliage began to show in late fall, I was intrigued to see that it was not roundish but flattish and very wide. Not a flower bud showed all through January and February. Finally, the old *N. B. conspicuus* flowered, and then, just as it was at its height, the newcomer deigned to open its very large, showy flowers on stiff tall stems. The blossoms were an inch and a half across and very weather resistant, and the long flattish leaves half as long again as any *bulbocodium* foliage I had ever seen.

Every year, the bright light yellow flowers of this magnificent plant have opened over a long season from a month to six weeks in an amazing show. In this one, we have something superb for Southern gardens and gardens on the West Coast during March and early April. The fact that the patch settled right down and began to produce seedlings in the mulch is proof that this *bulbocodium* is happy here (Fig. 28).

Experiments are now being made to see whether or not the late bloomer likes more moisture than I am giving it. Some of these little bulbs are meadow plants, and I may have been keeping this one too high and dry. It may even turn out that, in a moisture place, it would come into flower earlier, but it is good to know that, like *Zephyranthes atamasco*, it is willing to accommodate us under normal garden conditions.

NARCISSUS BULBOCODIUM

CAROLINE DORMON, *Louisiana*

Most gardens are so obsessed by great size, they give all their time and attention to large gaudily-colored flowers. But to a few of us, the tiny species, neglected orphans of the tremendous family Amaryllidaceae, are fascinating. Especially charming are the white-flowered forms of *Narcissus bulbocodium*, most of which bloom in winter. These snow-

Fig. 29. White-flowering *Narcissus bulbocodium* as grown by Caroline Dormon, Saline, Louisiana. 1. N. b. hybrid clone 'Nylon'; 2. N. b. *monophyllus;* 3. N. b. *tenuifolius;* 4. N. b. *foliosus;* and 5. N. b. *clusii.* Approx. 2/3 natural size. Drawing by Caroline Dormon.

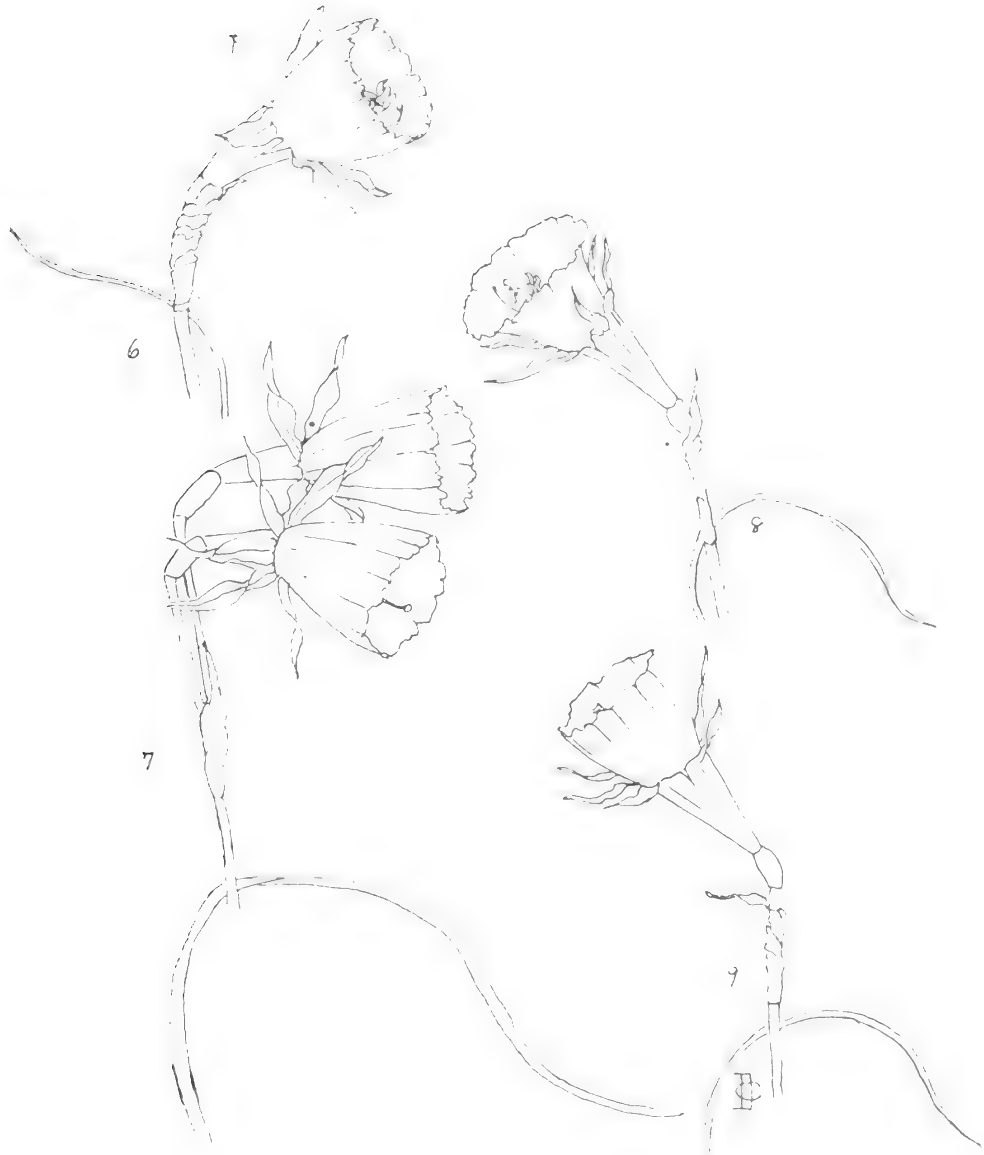

Fig. 30. Yellow-flowering *Narcissus bulbocodium* as grown by Caroline Dormon, Saline, Louisiana. 6. N. b. *obesus;* 7. n. b. species unknown; 8. N. b. *citrinus;* and N. b. *conspicuus.* Approx. 2/3 natural size Drawing by Caroline Dormon.

maidens include several species and forms, identification of which will always be the subject of controversy. By no means do I claim that my names are indisputable, I simply name them as they came to me, in each case giving the source. I have devoted a good deal of study to them, but information is exceedingly sparse—and contradictory.

The first to flower is delicate 'Nylon,' a hybrid (Fig. 29-1), bulbs of which Mr. Harold Epstein sent me. The crown is slightly flaring, edges erose; tepaltube long, segments comparatively short and wide; flower held erect, on a 5-inch stem. The leaves are very narrow, slightly flattened, 6 to 9 inches long, but reclining and do not hide the blooms. This is the purest white of all, with a delicious perfume. With me, it bloomed from Nov. 29 to Dec. 7.

The next to appear was *N. b. foliosus* (Fig. 29-4), the most remarkable of all in that it remained open nine days, outdoors, though the temperature dropped to 16° F. Each time it was frozen, I felt certain that anything so fragile looking would melt away, but when the sun came out, it stood up as perky as ever, and giving forth its exquisite perfume. The very short crown is fluted and flaring, erose and laciniate. The tepaltube is quite short, the segments of medium size. The stem is only 5 inches, but the numerous filiform leaves do not obscure the flowers. This one lasted from Jan. 8 to 27.

Jan. 15, *N. b. monophyllus* (Fig. 29-2) came into flower, another as white as a snowflake. It is very erect, on an 8-inch stem, tepaltube exceedingly long and slender, segments tiny. The crown is rather flaring, but slightly cupped, edges almost smooth, merely scalloped. This, too, posesses the characteristic perfume. Why "monophyllus", when there are always at least three filiform leaves?

N. b. clusii (Fig. 29-5) began blooming Jan. 12. The crown is broad, rather short, and slightly cupped; tepaltube rather long, segments of medium size; edge of crown finely serrate; deliciously fragrant. The stem is 7 inches, the very long leaves filiform, reclining, and almost "curly."

The smallest species, *N. b. tenuifolius* (Fig. 29-3) is also the last to come, not appearing until March 20. The stamens are hidden, a distinguishing feature. The crown is slightly erose. As the name would indicate, the leaves are very narrow. Flowers white, with delicate perfume.

The sulphur-yellow *N. b. citrinus* (Fig. 30-8) is also a winter bloomer, coming Feb. 28—which is really spring here in North Louisiana. It has an odd flaring crown, almost smooth at edges, and rather long tepalsegs. The leaves are narrow, but slightly flattened.

As the name would indicate, *N. b. obesus* (Fig. 30-6) has a rather fat crown, slightly cupped, edges dentate. The tepaltube is short, and the segments are the shortest and widest of all. The color is bright yellow, and the flower is not hidden by the rather short leaves. It bloomed March 8.

The next, March 12, marked "unknown" (Fig. 30-7), is going to bring outcries, as it is a mystery plant. The flowers are much the

largest of all, and there are *always two!* Some will say it cannot be a *bulbocodium*, but it is typical in every way, except for the long pedicels and the two flowers. The way I came by it is a rather strange story. Several years ago, I ordered *N. b. citrinus* from Jan de Graaf. Among them was this one bulb, which bloomed—and left me completely at sea. I drew it, and sent to Mr. de Graaf, with a pressed flower. He knew nothing about it. If he imported *citrinus*, this odd bulb could have slipped in. If it is a natural hybrid, it would seem to be between *N. b. conspicuus* and *Narcissus triandrus*—but where did it get that size? Each spring it provides excitement. The color is cream, but it fades quickly.

There is no need to describe the brilliant yellow *N. b. conspicuus* (Fig. 30-9). I have had it so long I do not remember the source. It blooms profusely the latter half of March, and supplies a gay note in any planting of small bulbs. It is so happy in my sandy soil it multiplies rapidly, and even reseeds. All my bulbocodiums are planted where they get full sun until noon. There are two *Cornus florida*, which being deciduous, allow full sun during growing and flowering period of the Bulbocodiums. My soil is poor sand, so I add iron gravel and some leafmold. I should say that perfect drainage is the secret of growing these charming flowers. No other small bulbs cover such a long flowering season, and their exquisite grace is almost unmatchable.

Where another source is not given, all of my bulbs came from the Heaths, The Daffodil Mart.

APHIDS AND THRIPS ON HEMEROCALLIS

HAMILTON P. TRAUB, *California*

In 1960, specimens of aphids and thrips that appear on *Hemerocallis* were collected and sent to Dr. Floyd F. Smith. They were identified as the aphid, *Myzus hemerocallis* Takah., and the thrips as *Hercinothrips femoralis* Reuter.

Aphids are not very important here at La Jolla, Calif., since they appear only during the winter and spring seasons as a rule, in the crowns of the plants. They usually do not cause any damage, and can best be controlled by overhead sprinkling. In only one instance known to the writer have they checked the growth of any *Hemerocallis* plant. In this case the new growth in the crown was attacked so severely that the plant was set back, and lateral sprouts appeared soon after.

In this cool coastal climate at La Jolla, Calif., damage by thrips is noted on amaryllis such as *Hemerocallis*, *Crinum*, X *Crinodonna*, *Hymenocallis*, and others, when the temperature reaches the range from 80° to 86° F., and the relative humidity is below 50%. When the temperature range is below 80° F., the infestations disappear. Temperatures in the higher range are not common here on the coast so that damage is usually not serious. It is remembered that in the greenhouse at Beltsville, Maryland, thrips damaged *Hemerocallis* plants severely if the thrips were

uncontrolled and the temperature was allowed to reach a relatively high level. In a short time under these conditions, the leaves could be destroyed in a few days.

LOCAL DISAPPEARANCE OF SNAILS

HAMILTON P. TRAUB, *California*

The large local snail, *Helix aspersa Moeller* *, was introduced from Europe many years ago into California as a source of food by southern European immigrants, but unfortunately, the Americans never accepted the snail as an article of food, and the snail multiplied and eventually spread over most of California as a pest that causes great economic losses.

At the writer's residence in La Jolla, Calif., the snail was abundant when he arrived in 1954, and it has been necessary to fight it each year at considerable expense with snail bait such as "Snail Roll" obtained from the local garden supply dealer. After fighting this pest for six years, the snail suddenly disappeared from the scene in 1960. During 1960, only three adult snails, and one immature one, were observed. The last was killed in July and since that time no others have been seen. It is realized that unless the snail has disappeared also in surrounding locations, eventually it will show up again by the wandering in of individuals which could then increase rapidly due to lack of competition.

The big question raised by this incident is the reason for this disappearance. If that were known it might be possible to wipe out the snails in the entire southwest. Possibly others have had similar experiences, and it would be interesting to have their reports in future issues of PLANT LIFE.

It is also of interest to report that the slugs have decreased in numbers but have not died out. Thus, whatever has killed off the snails has not affected the slugs to the same degree.

Part of the garden plot is devoted to the breeding of tetraploid *Hemerocallis*. The snails do not normally feed on this plant, and may eat it only as a last resort, if at all. But they do use the *Hemerocallis* plant as a home from which they sally forth. The regular rotation every two years when the old plants are removed and a new generation of daylilies are set out may upset the breeding of the snails. However, since only a portion of the garden is used in this way, this cannot be the real cause for the disappearance of the snails.

* Identified by Dr. R. Stohler, Dept. of Zoology, University of California at Berkeley.

VEGETATIVE PROPAGATION OF BRUNSVIGIA AND OTHER AMARYLLIDS

HAMILTON P. TRAUB, *California*

In the Tribe Crineae there is great variability in bulb offset production in the species and hybrids. Some hybrid clones of *Crinum*, X *Crinodonna* and *Brunsvigia* make offsets profusely, some make only a few, and still others never produce any. Mr. L. S. Hannibal, the foremost *Brunsvigia* breeder, reports that several of his named clones are 8 to 10 years old and yet he has only the original seedling bulb. This class includes such clones as 'Purity' and 'Apple Blossom'. He regrets that he cannot distribute offsets to other amateurs.

This problem can be solved by following a procedure used in curing growth stoppage in Amaryllis (see Traub, 1958, pp. 178-179). In the autumn before flowers are produced, the bulb is quartered as recommended for vegetative propagation in *Amaryllis* (Traub, 1958, pp. 128-129). These quarters are potted in coarse sand. They are placed in their original position in the pot and about ½-inch of coarse sand is filled in between them. The top of the quarters are barely covered with coarse sand. Water is given regularly as needed, but fertilizer is not applied until leaves appear above the surface. Each quarter will produce one or more bulblets. When the plants go dormant in summer, the quarters are removed from the pot, and the offsets are separated and set in the garden like one-year old *Brunsvigia* seedlings which are planted in the winter-rainfall garden.

This simple method of vegetative propagation may be applied to a variety of other amaryllids.

LITERATURE CITED

Traub, Hamilton P. Traub. The Amaryllis Manual, Macmillan, N. Y. 1958.

BULB BLACK ROT OF BRUNSVIGIA

A black rot of the bulb in *Brunsvigia* x *parkeri* (White hybr. UCLA) was noted for the first time in the writer's garden this season (1960). The back rot begins in the root base and later involves the entire stem part of the bulb. The roots decay, and the black rot begins to spread gradually upwards into the bulb scales. The disease is accompanied by only a moderate odor. Black rot differs from bulb decline brought on by watering *Brunsvigia* bulbs throughout the summer season. In such cases the bulb decay is not accompanied by the black color of the involved areas.—*Hamilton P. Traub*

PLANT LIFE

VOLUME 17

[Nos. 2-4, incl., Apr., Jul. & Oct.]

1961

GENERAL EDITION

EDITED BY

HAMILTON P. TRAUB

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THE AMERICAN PLANT LIFE SOCIETY

Box 150, La Jolla, California

PREFACE

Gardeners in southern California have been attempting to grow the Royal Poinciana, *Poinciana regia*, also known as Flametree and Flamboyant, but there are apparently no reports of success. This may be bound up with the difficulty of germinating the seeds. How this problem was solved is reported by Principe and Whitaker in the present issue. Now that the seedlings are available, the task remains of growing these to maturity. It is hoped that other Californians will also enter this interesting field, and will report their results in future issues of Plant Life.

Mrs. Paul A. Kane contributes notes on the culture of aroids, *Aristolochia elegans*, and *Agdestis* in Texas.

Mr. Sydney Percy-Lancaster of Salisbury, Southern Rhodesia, is apparently the first to undertake a comprehensive *Gloriosa* breeding project. We will all be interested in hearing of his work as it progresses. Anyone having *Gloriosa* breeding material in other parts of the world is urged to share it with Mr. Percy-Lancaster, whose address is given at the end of his most interesting first report in the present issue.

The Cycadaseae Committee had been in the organization stage for a number of years, when fortunately Mrs. Ben Roth consented to take over the Chairmanship. Members interested in this group should write to Mrs. Roth at 10223 Haines Canyon, Tujunga, Calif.

December 15, 1960,
5804 Camino de la Costa,
La Jolla, California

Hamilton P. Traub
Harold N. Moldenke

AFRICAN RAINFALL, VEGETATION AND SOIL MAPS

In the November 1960 Scientific American (vol. 203 (no. 5): 123-134), F. Fraser Darling in discussing the utilization of land south of the Sahara, presents generalized rainfall, vegetation and soil maps of that great region. These are of interest to the many Americans who grow South African amaryllids. It is significant that most of the soil types are not suitable for cultivation.

The summer- and winter-rainfall areas are not differentiated. A map of this kind showing summer- and winter-rainfall areas would be useful to those interested in growing South African amaryllids.

SEED GERMINATION OF THE ROYAL POINCIANA

JOSEPH A. PRINCIPE and THOMAS W. WHITAKER, *California*

THE ROYAL POINCIANA OR FLAMETREE, *Poinciana regia* Bojer (*Delonix regia Raf.*), is reputed to be one of the most popular, and certainly the most beautiful flowering tree in Florida. The species is a native of

Fig. 31. THE ROYAL POINCIANA OR FLAMETREE, *Poinciana regia* seedling as grown by Joseph A. Principe and Thomas W. Whitaker, La Jolla, Calif.

Madagascar. They are tropical, leguminous plants, requiring a frost-free environment for maximum growth. On the average the trees attain a height of 20-30 feet, with an equal lateral spread.

The flowers are borne in large racemes; individual flowers may be as much as 2 to 3 inches in diameter. In the early summer months the trees are a gorgeous sight, with a mass of scarlet flowers crowning the deep-green, finely-cut foliage. Later the fruits appear. They are heavy, strap-shaped pods, 2 inches wide and 2 feet long.

There seems to be no good reason why this beautiful plant could not be grown in protected locations, relatively frost-free, in sub-tropical southern California and similar areas. One of the principal bottlenecks to the widespread use of the tree is the difficulty most gardeners and nurserymen have experienced in germinating the seed. The seeds are about one-quarter inch long and have an extremely hard seed coat.

We obtained about one dozen seeds of *Poinciana regia* through the kindness of Dr. H. P. Traub. They were planted in a 6-inch pot in good garden soil. The soil was saturated at planting and kept moist thereafter. After two weeks in the soil, the seeds had not softened perceptibly, and there was no sign of germination. At this time, one-half the seeds were treated by slitting the seed coat with a sharp knife. The incision, perhaps as much as one-sixteenth inch wide, was made along the hilum, almost the length of the seed. In making the incision great care should be exercised not to damage the embryo. After treatment all seeds were replaced in the moist soil. Several of the treated seeds germinated within three weeks, and grew into good, sturdy, healthy plants (see Fig. 31). The remaining seeds deteriorated and decayed after about 6 months.

The experience recorded above suggests that seeds of the Royal Poinciana can be induced to germinate by slitting or possibly scarifying the seed coat, followed by reasonable care to prevent the invasion of rot producing organisms.

[Editorial Note.—Dr. Joseph C. Smith, La Mesa, Calif., reported to the writer that he planted *Poinciana regia* seeds in the garden, and that some of these germinated. This apparently is unusual in California since the writer had no success when he planted seeds in open. Seeds placed in water without scarifying did not swell even after 9 months in water.—*Hamilton P. Traub*]

CULTURE OF AROIDS IN TEXAS

MRS. PAUL A. KANE, *Texas*

Several years ago a bulbous plant was sent to me for possible identification. The gardener, who sent it to me, wrote that her family had settled in the area nearly 70 years ago and that many of the descendants of the original settlers still lived in that vicinity—Arkansas Post, one of the oldest settlements in the country is nearby.

The family start of the plant, she wrote, had been obtained from one of these neighbors when it was the custom to "swap" seed, plants and shrubs every spring.

As soon as I unwrapped the plant it was obvious that it was an *Arum*, but which species? Careful reading of encyclopedias and catalogs did not answer the question. At last a beautiful picture, in a catalog, settled the issue. It was *Arum italicum*, native of Europe. One cannot help wondering which flower-loving settler had carried it to that part of Arkansas from which it was sent to me.

Since that time it has settled down to grow, quite happily, in several San Antonio gardens, where it produces handsomely variegated foliage all winter from late November through April. This light-veined foliage is a boone to flower arrangers, for once "hardened" by overnight immersement in cold water, the leaves last ten days or more in a cool room.

The small bulbs do not bloom, nor is the foliage on these as striking as on mature plants. The old bulbs put out an odd greenish-yellow spathe and later a spike of dark orange-red seeds is formed. As the berries ripen and drop off, the foliage dies away and the bulb goes entirely dormant through the hot summer.

The plants are in various sections of the garden but appear to grow best in a rich sandy loam to which has been added peat moss, peanut hulls and vermiculite, thus providing a soil that never dries out entirely, yet has excellent drainage. All are grown in partial shade as those planted in full sun died the first year.

To provide year-round foliage in these spaces the *Arum italicum* is interplanted with *Hydrosme rivieri* (syn.—*Amorphophallus rivieri*) This puts up interesting, much-divided foliage on a spotted stem, just about the time that the *Arum italicum* has gone dormant, thus providing an attractive background for the colorful fancy-leaved caladiums which occupy the foreground of the bed all summer. Grey and white *Nepeta hederacea variegata* and purple leaved *Ajuga* cover the brick edging which raises the bed slightly above the surrounding area.

The *Hydrosme rivieri* has the local reputation of being hard to find once the foliage has died off, so it is transplanted in full leafage. It does not appear to resent this treatment, rarely even wilting though the temperature may be in the 80's by this time of the year. It increases fairly quickly by offsets which may appear some distance from the parent plant and propagation is from these small plants rather than disturbing the large bulb. All bulbs of *Hydrosme rivieri* are left in the ground all year, evidently they are hardier than formerly surmised. The temperature in San Antonio may drop as low as 14° F. in January or February and occasionally reach a high of 105° F. in mid summer. This plant has been grown in San Antonio for many years but *Arum italicum* seems to be a new introduction to local gardens.

GLORIOSA BREEDING PROJECT, 1960

S. PERCY-LANCASTER, F. L. S., & A. PERCY-LANCASTER,
779 Mansfield Road, Marlborough,
Salisbury, Southern Rhodesia

The name *Gloriosa* was given by Linnaeus to a race of climbing herbaceous plants, all of which are indigenous to either Tropical Africa or Tropical Asia. The first named species was *Gloriosa superba,* indigenous to India and introduced to England as far back as 1690. It is because these plants were both glorious and superb that my son and I were attracted to them many years ago in India. Since we have come to Africa our interest has been heightened by the many species and varieties we have found near Salisbury, the attractive Capital of this new home of ours, Southern Rhodesia.

Gloriosas are easy to grow, anything but fussy in their cultural requirements, and most rewarding in their return of flowers when happily established. We, my son and I, have had some experience of these beautiful plants in their natural habitat and would like to put this knowledge of them at the disposal of readers and to encourage a greater interest in them. We ourselves have gained an added interest because the Gloriosa is Rhodesia's national flower. Here it is known as the Flame Lily.

In India, *Gloriosa superba* is fairly wide-spread and is found from the state of Bombay in the West to Assam in the East. These are plants of fairly open scrub land, and grow at the base of thorny shrubs up which they climb for support. Near Sanchi they grow among thorny Capparis shrubs in fairly sandy soil. Around Kathgodam, in the foothills of the Himalayas, the soil is gravelly and even stony in parts. They are happy, too, where the silt of the great Bramaputra enriches the adjoining alluvial plain when in occasional flood. There are, as far as we know, only two species in India, *G. superba* and its yellow form, *G. superba* var. *lutea (aurea).*

The African Gloriosas are our current study, and we can only tell of the finds of one year so far. These were collected mainly within a forty mile radius of Salisbury. One, a dwarf yellow species, we found a hundred yards from the sea at Beira in the Mozambique province of Portuguese East Africa. We have found that Gloriosas are indigenous to South Africa, South West Africa, Central Africa, (the Federation of the Rhodesias and Nyasaland), the Belgian Congo, French Equatorial Africa, Kenya, Tanganyika, Uganda, Nigeria, Ghana, Sierra Leone, Sudan, Ethiopia and the Cameroons.

It is not surprising, therefore, that there is a variety of form and colour when one considers the climatic and elevation variation, the soil conditions and the ecological differences that exist from the sandy sea shore in Portuguese East Africa to an elevation of 7500 feet in Kenya.

But let me tell you of the local conditions under which we have collected approximately 600 tubers this last season. These show an interesting variation and point to the fact that the genus is anything but

intolerant. Within a mile of our Marlborough suburban home there is a tract of low lying boggy land, called vlei (pronounced flay). The soil is heavy black clay which during the rains has the consistency of plasticine and which in the dry weather hardens to the like of cement. Termites here and there have erected mounds, perhaps 3-4 feet high by 8-12 long, and we found the majority growing at the bases of these derelict ant hills, trailing their stems over the tall grass that is so very much part of the Rhodesian landscape. Salisbury, by the way, is set in attractive hilly country at an elevation varying between 5000 and 5500 feet above sea level. Further afield we have found species growing from the sandy banks of streams, their bases most certainly covered by water when heavy rains swell the flow. They grow happily, but with less luxuriance, on the rocky slopes of hills called Kopjes (Koppies), where the soil may be a greyish grit from great basalt rocks or a bright red haematite. Because of the vigorous and tough grasses to be found everywhere except in the meanest land, their removal is not the easiest of operations, more so since any damage to the rooting system means almost instant collapse. We have found tubers with only an inch or two of soil cover and have also had to dig them up from a depth greater than twelve inches. And the growth? Some a mere foot high topped with a single flower, others with ten feet, or more, of succulent stems carrying from 15-20 blooms per plant.

The wealth of variety on our doorstep suggested possibilities of greater variation further afield. In response to over a hundred letters to every country in Africa, to India, to Ceylon, to Malaya and to Burma, we have had mere acknowledgements, courteous interest, reference to others, promises of help, and—to our joy—gifts of tubers. We have learned (from Kew) that no scientific work has been done on this genus for 67 years and, from the correspondence received, that there is utter confusion in nomenclature. Of one thing my son and I are sure and that is that the *Gloriosa superba*, which is indigenous to India, is not the same as a plant called "*G. superba*" in Africa. Having now achieved a collection of approximately 600 tubers we plan to grow and study them, record their horticultural differences, photograph and plant their flowers and foliage, and if possible, enlist the aid of a botanist in sorting out species from varieties and possible natural hybrids.

In response to a request for help the Director of the Royal Botanic Gardens at Kew very kindly recommended various publications that we should consult and we have asked for extracts to be made. Dr. H. P. Traub has listed a number of recorded species citing relevant literature. Gardening Cyclopedias, both American and English, have been consulted, and while they refer to some of the species, details which might be helpful in identification are lacking. In one instance, *G. abyssinica*, the colour of the flower has not been stated.

From the literature available and from correspondence so far received, it is clear that it is necessary to collect both material and more information. A list of species described in various publications to which

we have access, is as follows. This table is obviously subject to correction in the light of further researches.

GLORIOSA L.

1. **abyssinica** A. Rich. (in Tentative Flora. Abyss. 2: 322.). Abyssinica. Fls. yellow (?), plant 1½—2 ft. high.
2. **aurea** Chiov. (in Pl. Nov. Aethiop. 8: 1928). Somaliland. Fls yellow.
3. **carsonii** Baker (Kew Bull. 74. 1895). British Cent. Afr. Fls yellow & purple, plant 8—10 ft. high.
4. **greeneae** Hayward (Winter Park Sun, Fla. USA.). Fls. yellow, plant 10—12 ft. high.
5. **leopoldiana** (Paxton's Bot. Dictionary). Fls yellow, plant 2 ft. high.
6. **leopoldii** Hort. (syn.-**simplex** var. **grandiflora**), Bailey's Cyclopedia Amer. Hort.
7. **lombei** de Wild. (Fedde Repert 9: 536. 1913). Republic of Congo.
8. **lutea** (Van Tubergen price list). Fls yellow.
9. **magnifica** (Chandra Nursery, Sikkim, price list). Fls yellow and scarlet.
10. **minor** Rendle (Jour. Bot. 132. 1896). Trop. Afr.
11. **nepalensis** (Paxton's Bot. Dictionary), syn.- **G. superba L.**
12. **plantii** Loud. (syn.- **simplex** L.; **virescens** Lindl.)
13. **richmondensis** Hort. (Jour. RHS. London), Fls. yellow, plant 6 ft. high.
14. **russellii** Hort. Fls. yellow, purple tipped, plant 6 ft. high.
15. **rothschildiana** O'Brien (Bailey's Cyclo. Amer. Hort.). Trop. Afr. Fls yellow and crimson, plant 4 ft. high.
16. **sampiana** P. Lima (Broteria, ser. Bot. 19: 112. 1921). Afr. Lusit. Or.
17. **simplex** L. (Mant. 1: 52.) Trop. Afr. (syn.- **plantii** Loud. and **virescens** Lindl.) Fls. yellow and scarlet; 2—3 ft. high.
18. **simplex** var. **grandiflora** (syn.- **Methonica grandiflora** Hook.), (Bailey's Cyclo. Amer. Hort.
19. **superba** L. (Sp. Pl. 305.) Trop. Asia; fls. yellow and scarlet; plant 12—15 ft. high.
20. **superba** aurea. Zanzibar. Fls. yellow.
21. **superba** cv. 'Yellow Joy' (Wyndham Hayward, Winter Park, Fla., price list.) Fls. yellow.
22. **superba** var. **africana** (Van Tubergen price list). Trop. Afr. Fls. yellow and scarlet; plant 6 ft. high.
23. **virescens** Lindl. (Bot. Mag. plate 2539) Trop. Afr. Fls. yellow & scarlet, plant 3 ft. high.
24. **verschuuri** Hoog (Jour. RHS 1950, p. 22). Hab.?

Dr. J. C. F. Hopkins, A. I. C. T. A., Senior Plant Pathologist, Department of Agriculture, Salisbury, Southern Rhodesia, in "Common Veld Flowers," says that the difference between *G. superba* and *G. virescens* lies in the fact that "the former has wavy, curled or twisted petals whilst the latter has petals which are flatter and only slightly curled."

The name "simplex" implies a single, unbranched stem and we presume the name applies to a dwarf type with crimson red flowers which is fairly common around Salisbury. Among the dwarf Gloriosas we have collected were some on which the stem forked. This may be due to the fact that these were young plants of species other than *G. Simplex.* The term "virescens" means "becoming green" and is stated in the Royal Horticultural Society's Journal to be a synonym of *G. simplex;* it may be a variety, for we have a dwarf form in which the basal yellow of the petals is tinged green. *G. plantii* is reported by the R. H. S. to be another synonym of *G. simplex.*

The following species of Gloriosa were cultivated by us whilst in India; they came from Kew.

G. carsonii, tall growing, flowers yellow & purple.

G. richmondensis, tall growing, flowers deep yellow with a dark chocolate basal dot.

G. russellii, tall growing, flowers yellow with a narrow mauvy purple stripe at the tip of the petal.

G. superba, tall growing, flowers scarlet & yellow.

G. superba aurea, tall growing, flowers deep yellow.

G. rothschildiana, four feet high, flowers crimson & yellow.

G. simplex, dwarf, two feet high, flowers orange red & yellow.

In addition we grew many other un-named varieties as well as hybrids.

The actual rooting system of Gloriosas is fairly poor, for approximately 25-30 thin, thread-like roots are produced in a rough circle just below the new growing point. These grow only 2½-3 inches in length. *Gloriosa* shoots are liable to re-appear in a different place from where the tuber was originally planted because new growth forms at the extreme tips of the arms of tubers. The larger the old tuber grows the further away will the new shoots appear. The underground stem is very lightly attached to the tuber, and in consequence the lifting of a Gloriosa while in growth is fraught with a certain amount of risk. If the rooting system is damaged the new tuber may not develop strongly enough to flower the following year or may not develop at all.

The foliage of the Gloriosas we have collected have shown a wide variation in size and shape. Some leaves may be only 3 inches long by a quarter inch in width, linear lanceolate in shape, while others measure 7 inches long by 3 inches wide with a more or less cordate base and generally ovate lanceolate in shape. The leaves may be alternate or opposite, and in some instances have appeared in threes. In colour we have found that the green varies in shade; while the majority are glabrous some have a glaucous flush on one, or both, surfaces. The tendrils, too, may be short and hooked, or long and curled. Many plants develop these tendrils like the hair-spring of a watch.

The flowers show a great variation in shape. Some are vase shaped, narrow at the base and reflexing toward the top. Some flowers have their petals erect while in others the tips are incurved or even irregular. A few have a distinctly erect flower, the edges of the petals being heavily crisped and narrow. One small flowered form which we collected had its petals so incurved as to appear almost spherical. The petals of some species are almost flat with only slight undulations at the edges; others are very wavy.

The colour of the flowers shows a fascinating variation. A few species or varieties of species, have a pure colour throughout, but most have a combination of two colours in varying degrees. We have specimens which are pure yellow. Some of these are lemon, others cream and others yet a deep chrome. In some of the specimens there is a chocolate blob at the base of each petal to distinguish them. We have found one yellow variety (species?) with green instead of chocolate at the basal end of each petal. The more common species are bicoloured though we have one that is more or less entirely crimson. Generally, however, there is a distinct "basal" v-shaped patch of yellow to the bicoloured species and varieties, the other colour ranging from orange-red, through vermilion to crimson; and one species has pale purple as the predominant colour. We have also found a variety (species?) in which the colour predominating is green, the petals having flecks and streaks of red in varying degrees. Could this be the true *G. virescens* originally described by Lindley? We are watching these plants with particular interest.

The colours described above relate to freshly opened flowers before the petals begin to mature and then droop around the swelling ovary.

Once the stigmas have been fertilised, or when the flower is past its prime, it begins to alter, changing to a shade, or tone, of its former colour. The crimsons usually turn a mauvy red, the orange reds to a deep pink or light red, the purple to a lilac, and in one yellow species the faded petals are an attractive salmony pink. How much these observations are related to climate and soil remains to be seen. Mrs. Sima Eliovson in her book "African Flowers for the Garden," includes a page on Gloriosas and extracts about *G. superba* and *G. virescens* are quoted below:—

"The flowers of *G. superba,*" she says, "are pure yellow or bright orange. They are pale when they open and deepen as they mature. The petals expand outwards as they age." The type grown in India has flowers whose petals are bright scarlet with the basal ends yellow.

Mrs. Eliovson in referring to *G. virescens,* states that "the flowers are generally bicoloured, the base of the petals being flushed with yellow and the top half being deep orange in the commonest form. There are other colour forms which include a deep purple outlined in yellow and a deep wine crimson with a yellow base. These are the most attractive." She continues, "When the flower begins to open it is a greenish yellow, thus probably giving rise to its specific name of *"virescens."* This species is presumed to be the same as that grown under the name of *G. Plantii.* Another name, *G. simplex,* is regarded as a synonym of *G. virescens* and the horticultural name of *G. leopoldii,* is also believed to be a form of *G. virescens.*

Tubers. One year old tubers are almost spherical and roughly the size of a pea, some of these develop a slight protuberance on one side. Thereafter each usually forms two arms like a wide open V; the tuber is thickest at the junction of the arms. The shape and size of tubers varies with age and the conditions under which they are grown. In sandy soil the two arms often grow downwards. In heavy soil, however, they are found to lie almost parallel to the surface. Anyone who has grown Gloriosas knows that the tubers are V shaped where grown in sandy soil or in loam. Usually one arm of the V is longer than the other. This is a generalisation, however, for in nature the tubers develop much variation from the typical shape. When constricted by rocks, or restricted by stones, they take on the oddest shapes; some are almost spherical, and some have the two arms twisted around each other into grotesque forms. We have some boomerang-shaped and some with three arms. We have flowering tubers which are only $2\frac{1}{2}$-3 inches long and not more than a third of an inch in diameter. Our largest specimen measures 14″ long, $1\frac{1}{2}$ inches in diameter.

As previously mentioned the tubers are very brittle and need care in handling. The juice contains colchicine and is poisonous.

Up to date we have received contributions of Gloriosa tubers from the following sources:—

Ghana—**G. superba.**—six tubers.
India—**G. carsoni, G. magnifica, G. richmondensis.**—three tubers each.
Kenya—**G. simplex.**—four tubers.

Mozambique—G. superba. Three colors.
Sierra Leone—G. simplex. [illegible]
Sudan—G. simplex. [illegible]
Zanzibar—G. superba aurea. Three colors.

ARISTOLOCHIA ELEGANS IN TEXAS

Mrs. Paul A. Kane, *Texas*

Common names have long been the bane of careful gardeners, especially when endeavoring to find some muchly desired plant to add to greenhouse or garden collection.

Dutchman's Pipe is the common name throughout the United States for two different species of *Aristolochia*. North of the Mason and Dixon line, *A. macrophylla* (syn. *A. Sipho*) is called by this name. This species has very large leaves, rounded at the point, and comparatively small flowers of a shape truly resembling an old-fashioned, wide-mouthed pipe.

In the southern states, *A. elegans* is also called Dutchman's Pipe, although elsewhere it is known as Calico Flower. The latter name is much more descriptive, since the "pipe" form is lost when the flowers open. The blossoms are from 3 to 4 inches in diameter, velvety in texture and spotted and veined in such a way as to resemble the calico for which it is named. The ground color is a dark chocolate brown, marked with white and yellow. This species does not have an unpleasant odour. It is easily raised from seed and usually flowers the first year.

A. longifolia is a low-growing plant with slender leaves which do not resemble the foliage of the vines mentioned above. The flower is tubular with a suddenly flaring midsection, and the blossom calls to mind the hooded cobra snake of India. The entire flower is only from 2 to 3 inches long, borne about five inches above the ground, so it is easy to overlook it in the wild. It is native to Texas but almost unknown in gardens. It prefers a dry, well drained situation in full sun.

GENUS HOSTA

Nils Hylander presents an article on "The Genus Hosta" in the Journal of the Royal Horticultural Society, LXXXV: 356-365, 1960. He includes the cultivated species; thirteen in number.

DWARF PRUNUS

Mr. H. F. Watson, (in Gardener's Chronicle, page 457, June 11, 1960), discusses the very rare *Prunus prostrata*, which is slow growing and will take many years to reach a height of 2 ft. It is native of the Atlas Mountains of North Africa, Greece and Crete. It is hoped that members who have had experience with this rare plant will report in future issues of Plant Life.

PLASTIC FOR GREENHOUSES

Research at Cornell University has shown that greenhouses covered with two layers of transparent plastic—1 to 2 inches apart—reduced heating costs by 40%. In addition, more light was transmitted than when a single layer was used which allows a film of moisture to collect that shuts out some of the light. (Sheldrake, R. and Langhams, R. W., in Bull. N. Y. St. Flower Grs. No. 166, pp. 1—2).

CULTURE OF AGDESTIS IN TEXAS

MRS. PAUL A. KANE, *Texas*

This graceful vine is often mistaken for *Clematis*, which it much resembles. The white, sweet-scented flowers are small but numerous, borne in dense panicles from August until frost. The leaves are heart-shaped, gray-green and when bruised give off a most unpleasant odour. This smell is very noticeable when frost kills back the plant, so it is advisable to plant it some distance from a residence. The plant springs from a huge tuber, several found in San Antonio have been up to 24 inches in length and six to eight inches in diameter. Smaller tubers may be found and it is easy to propagate by removing these and replanting in rich, moist soil. A sunny situation is best and where it is satisfied it will reach 35 feet in a season. The botanical name of this vine is *Agdestis clematidea* Moc. et Sessé.

RODENTS AND CYCAD SEEDS

Recently the writer received seeds of *Cycas media* from Mr. W. Morris of Warners Bay, N. S. W. The fleshy covering had dried so that it was very hard and difficult to remove. Thus the seeds were planted without removing it. After a short time, rodents began to gnaw on it and actually carried away some of the seeds. An inspection showed that on the remaining three seeds the covering had softened so that it could now be easily removed. It is suggested that when seeds with hard coverings are received, that they be soaked in water until the covering has softened enough so that it can be removed before planting to avoid attracting rodents.—*Hamilton P. Traub*

PLANT LIFE LIBRARY

A RESUME OF THE VERBENACEAE, AVICENNIACEAE, STILBACEAE, SYMPHOREMACEAE, AND ERIOCAULACEAE OF THE WORLD, by Harold N. Moldenke. Publ. by the author, Trailside Museum, Watchung Reservation, Mountainside, New Jersey. 1959. pp. 495. $9.75.

This monumental work by the World authority on these groups includes the valid taxa, geographic distribution and synonymy. A total of 111 genera, 4801 valid species, subspecies, varieties, forms and named hybrids are listed; and a complete dichotomous key to the genera and to the 233 accepted supra-specific and supra-generic subfamily groups is presented for the first time. A total of 9212 rejected names are accounted for. In the course of his researches over a thirty year period, the author critically studied and annotated 155,940 herbarium specimens from the world's leading private and institutional herbaria.

This outstanding book is indispensable to all interested in plant systematics, and is highly recommended.—*Hamilton P. Traub.*

STATISTICAL METHODS IN BIOLOGY by Norman T. J. Bailey, John Wiley & Sons, Inc., New York, N. Y. 1959. pp. 200. $4.50. In the opinion of this reviewer, "Statistical Methods in Biology," is one of the best of the elementary texts on statistics. As a class such books attempt to assist the non-mathematical biologist to grapple with problems of variation in his material. Some turn out to be little more than "cook books", while others, with their awesome array of symbols and formulae frighten away all but those with some previous mathematical training. Dr. Bailey has skilfully avoided these dilemmas. His text can be used as a "cook book", but in the discussion he is careful to give a lucid explanation of the principles underlying each concept. In the Preface he promises that the reader need have no more than an elementary knowledge of algebra to read the text with comprehension; trigonometry, geometry and calculus are not required. Dr. Bailey has fulfilled this pledge surprisingly well.

The book follows the conventional pattern of elementary statistical texts. The contents are indicated by the chapter titles which follow: Variability and frequency distribution; Estimation, standard errors and confidence limits; The basic idea of a significance test: Simple significance tests based on the normal distribution; The use of *t*-tests for small samples; Contingency tables and X^2; X^2 tests of-goodness-of-fit and homogeneity; The correlation of measurements; Regression analysis; Simple experimental design and the analysis of variance; Introduction to factorial experiments; Random samples and random numbers; Partial correlation and regression. The final chapter, "Notes on computing and calculating machines" will be helpful to the novice anxious to master the most efficient methods of solving statistical problems using these machines.

In the rear of the book there is a single page devoted to "Suggestions for more advanced reading". Nine well known statistical reference works are cited. Also there is a "Summary of statistical formulae" consisting of about 28 pages. Included in the Summary is a list of the symbols used, their meanings, and a guide to its use. The guide should be particularly helpful to beginners because it indicates the types of distributions that are likely to occur in biological material and gives an example of each. This is followed by directions for finding the type of analysis required for the specific data under study. Five of the most commonly used statistical tables are reprinted in the Appendix. In addition, there is a useful and accurate index.

Within a space of 200 pages Dr. Bailey has crammed an amazing amount of elementary statistical information, well presented and easily digestible. Biologists in both the theoretical and applied fields could increase the proficiency of their experimental work by frequently consulting this text. *Thomas W. Whitaker.*

INTRODUCTION TO QUANTITATIVE GENETICS, by D. S. Falconer. Ronald Press Co.; New York 10, N. Y. 1960. Pp. 365. Illus. $6.00. Biologists as a group are commencing to realize the importance of quantitative characters as opposed to qualitative ones in studies of evolution, plant and animal improvement, and human heredity. Investigations of the inheritance of characters that differ in degree rather than in kind, and therefore have to be measured, are time consuming to record and difficult to analyze. Development of new methods and new techniques for the

study and analysis of such data have stimulated the production of a number of books on quantitative genetics in recent years.

The author of the text under review is a member of the Agricultural Research Council's Unit of Animal Genetics, located at the University of Edinburgh. A perusal of his published work indicates that he has been mainly concerned with problems of selection, correlation and size inheritance. It is evident that Dr. Falconer is well qualified by experience and training to discuss quantitative genetics in a critical and constructive manner.

The book is not aimed at any particular class of readers, but the prospective user should be warned that some familiarity with genetics and statistics is assumed. The author has purposely stressed general principles. Quite frequently principles are illustrated by examples (labeled as such) which take the form of problems extracted from pertinent literature. The subject matter is organized so that certain chapters can be omitted without loss of continuity should the reader's interest be confined to special topics.

There is a "GLOSSARY OF SYMBOLS" used in the book, an "INDEXED LIST OF REFERENCES" of about 240 citations, and a serviceable "INDEX". Altogether, an excellent book both for teaching and reference.—*Thomas W. Whitaker.*

PRINCIPLES OF PALEOBOTANY, by Wm. C. Darrah, 2nd ed. Ronald Press Co., 15 E. 26th St., New York 10, N. Y. 1960. pp. 295. illus. $6.50. This revised second edition of Prof. Darrah's text after the lapse of twenty years is a significant event. It provides a general introductory survey of the subject for the nonspecialist—a one-quarter to one-semester undergraduate and graduate courses. After discussing biological and geological principles, the aims of paleobotany, paleobotanical techniques, and the plant records are considered. The rest of the text is concerned with discussions on the origin of existing floras; pollen analysis and floristics; fossil plants and evolution; and a reasonable phylogeny. This concisely written text is highly recommended.

DEVELOPING CELL SYSTEMS AND THEIR CONTROL, edited by Dorothea Rudnick. Ronald Press Co., 15 E. 26th St., New York 10, N. Y. 1960. pp. 240. illus. $8.00. This important book contains the papers presented by outstanding authorities at the 18th Symposium of the Society for the Study of Development and Growth. The subjects discussed include development in the cellular slime molds; regeration in hybroids; tissue reconstruction; gibberellins and the growth of flowering plants; hormonel control of growth; regeneration of bony parts in vertebrates; biochemical sequences in mitosis; biochemical and staining reactions of cytoplasmic constituents; and protein synthesis. This stimulating book is highly recommended.

DISEASES AND PESTS OF ORNAMENTAL PLANTS, by P. P. Pirone et al. 3rd ed. Ronald Press Co., 15 E. 26th St., New York 10, N. Y. 1960. pp. 775. illus. $10.00 This third edition of a well-known text on the diseases and pests of ornamentals will be welcomed by gardeners It is concerned with the diseases, pests and other troubles that affect nearly 500 genera of ornamental plants grown outdoors, under glass, or in the home. Part I is devoted to symptoms and causes of plant diseases; insect and other animal pests; and control measures. In Part II, the diseases and pests of particular hosts are arranged alphabetically by names of the hosts.

THE CLASSIFICATION OF LOWER ORGANISMS, by H. F. Copeland. Pacific Books, Palo Alto, Calif. 1956. pp. 302. illus. $7.50. This stimulating book proposes the recognition of two kingdoms—*Mychota* and *Protoctista*—to include the organisms in the borderline zone between the plant and animal kingdoms. The *Mychota* include organisms without nuclei, and the *Protoctista* include organisms "not of the characters of plants and animals." Dr. Copeland has produced a scholarly volume in presenting complete systems of phyla, classes and orders of *Mychota* and *Protoctista*, and also the subordinate groups below the orders to a considerable extent. Here for the first time one finds the strict application of priority to the names of the lower organisms; and also a comprehensive synonymy. This

is an important text and reference work that every student and research worker in biology must have in his private library.—*Hamilton P. Traub.*

STAINING PROCEDURES, ed. 2., by H. J. Conn, [illegible] Emmel, et al. Williams & Wilkins Co., Baltimore 2, Maryland. [illegible] These procedures are used by the Biological Stain Commission and are [illegible] under its auspices. General methods are presented in the introductory section. Part I is concerned with methods in animal histology: methods for general tissue and connective tissue, neurological staining methods, methods for blood, bone and bone marrow, and cell constituents. Part II is devoted to methods in plant histology: methods for general tissue, pollen and pollen tubes, and cytological methods in sections. Part III is concerned with microbiology [illegible] staining procedures. This valuable reference work is recommended to all interested in staining procedures.

PLANT PATENTS, 1957 AND SUPPL. 1957, 1958, & 1959, publ. by American Association of Nurserymen, 635 Southern Bldg., Washington 5, D. C. pp. 40, 6, 8, and 6. This series includes plant patents 1 through 1892. These are listed under patent number; type of plant; date patent was granted, originator or discoverer; if assigned, then name of assignee; and common name. For easy reference, there is an alphabetical index by genera and common name, with patent number under the generic entries. Highly recommended to all interested in plant patents.

COMPARATIVE MORPHOLOGY OF VASCULAR PLANTS, by A. S. Foster and E. M. Gifford, Jr. W. H. Freeman & Co., 660 Market St., San Francisco 4, Calif. 1959. pp. 555. illus. 213. $9.00. This attractive book was prepared with the objective of providing not only a purely factual description of all the main groups of vascular plants, but also to display clearly the procedures, general principles, and objectives of comparative morphology. The concept of homology, and sources of evidence in morphological interpretation, are presented in the first chapter. The salient features of vascular plants, the vegetative sporophyte, sporangia, gametangia, and embryology, are covered in the five following chapters. The description and classification of vascular plants are detailed in the next eleven chapters. The last two chapters are devoted to the general morphology and evolution of [illegible] and the reproductive cycle in angiosperms. This outstanding text is highly recommended to all interested in plant science, particularly to those interested in morphology and systematics.

NATURE AND MAN'S FATE, by Garrett Hardin. Rinehart & Co., 232 Madison Av., New York 16, N. Y. 1959. pp. 375. [illegible] This [illegible] book has as its aim to bring the reader abreast of the latest thought in evolutionary theory, and to show him its implications for the future. The author relates the life and discusses the work of Charles Darwin, showing how the theory of evolution was later complemented by the rediscovery of Mendel's laws of heredity, particularly as it was refined by later workers. He shows that generally accepted biological facts make possible man's understanding of the rules that govern all knowledge of life, including the knowledge that may in part determine man's own fate. This most stimulating book, brilliantly written, is required reading for all biologists.

SUCCULENT PLANTS OTHER THAN CACTI, 2nd. ed., by A. Bertrand. Philosophical Library, 15 E. 40th St., New York 16, N. Y. 1959. pp. 120. illus. $4.75. The English text of this edition was edited by Vera Higgins. The chapters are devoted to natural environment of succulents, cultivation, propagation, enemies, the families of succulents, Agavaceae, Liliaceae, Asclepiadaceae, Crassulaceae, Euphorbiaceae, Ficoideae, and various families. This is an excellent brief account with black & white, and color plates.

GARDEN IDEAS AND PROJECTS, edited by R. D. Whittemore. Doubleday & Co., Garden City, N. Y. 1959. pp. 532. illus. $3.95. This practical book presents many ideas on how to make the garden more attractive and livable. It includes sections on tools and equipment; projects with wood, masonary; special gardens;

common garden mistakes corrected; practical calendar for home gardeners; and a self-pronouncing dictionary of plant names. The book is reasonably priced, and is recommended to all gardeners.

JUST BEFORE DARWIN, by Milton Millhauser. Wesleyan University Press, Middletown, Conn. 1959. pp. 246. illus. $4.50. Subtitled "Robert Chambers and Vestiges", this outstanding book presents the story of Robert Chambers, a forerunner of Charles Darwin, and Chambers' book, "Vestiges of the Natural History of Creation" (1844). "Vestiges" became a highly controversial book, and served more than any other to break down resistance to the theory of evolution among laymen and scientists. Not only does Millhauser's book present the story of an outstanding man, but also provides a vivid picture of the intellectual climate in England of the time. This is must reading for all biologists.

LIGHT AND PLANT GROWTH, by R. van der Veen and G. Meijer. Macmillan Co., 60 Fifth Av., New York 11, N. Y. 1959. pp. 161. illus. These eminent research scientists first present the basic facts about the effects of light on plant functioning—measurement of light for plant irridiation; photosynthesis; phototropism; phototaxis and photonasty; photoperiodism; and effect of color of light. This presentation is followed by details concerning the use of artificial light in horticulture. This concise text on an important subject to the gardener is highly recommended.

THE HANDLING OF CHROMOSOMES, 3rd ed., by C. D. Darlington and L. F. La Cour. Macmillan Co., 60 Fifth Av., New York 11, N. Y. 1960. pp. 248. illus. This third edition of an outstanding text, including the advances in the subject of the past ten years, will be welcomed by all interested in cytological technique. The added new methods in autoradiography, and for the estimation of nucleic acid, are timely. After discussing the origin, scope and purpose of the work, chapters are devoted to equipment; living chromosomes; bulk fixation; smears and squashes; paraffin methods, staining and mounting; special treatments; control of mitosis, and fertilization; photography; and describing results. The appendix is concerned with sources of material, standard solutions, schedules of treatment, and catalogue of implements. Errors of omission are few. Unfortunately, with reference to combined fixing, staining and mounting media and procedures, the authors are almost a decade behind the times since they still include the long outmoded and unworkable gelatine method of Zirkle (1940) on pages 47 and 145; and do not include the new arabinic acid method (Plant Life 7: 155-157. 1951; Euclides (Madrid), *13*: 103-114; 149-159; 289-298; 445-446. 1953; *14*: *222*; 61-63. 1954.) Also the citation, Visser (1955), is not included under the references. These, however, are errors that can easily be corrected in a future edition. The book is highly recommended since it is required for constant reference in every cytological laboratory.

BONSAI; JAPANESE MINIATURE TREES, by Kan Jashiroda. Chas. T. Branford Co., 75 Union St., Newtown Centre 59, Mass. 1960. pp. 166+48 plates. $5.75. This fascinating, profusely illustrated book ranks among the outstanding ones on the art of producing Japanese miniature trees. All phases of the subject are adequately treated—history; kinds of styles; technique of dwarfing; raising from seeds and cuttings; miniature bonsai; bonsai culture of chrysanthemum; and cultural directions. Highly recommended.

ENCYCLOPEDIA OF GARDENING, by S. B. Whitehead. Chas. T. Branford Co., 75 Union St., Newtown Centre 59, Mass. 1960. pp. 789. illus. $5.00. This is the U. S. edition of Wright's well-known work written from the English point of view as revised by S. B. Whitehead. This book was originally written by a gardener for gardeners, and this approach has been preserved in Whitehead's revision. In the main body of the book, the subject matter is arranged alphabetically. This is followed by an illustrated calendar of practical garden work; an outline of garden science; and an appendix of modern techniques.

FRAGRANCE AND FLAVORS, by Rosemary Hemphill. Chas. T. Branford Co., 75 Union St., Newtown Centre 59, Mass. 1960. pp. 104. illus. $3.00. This U. S. edition of a delightful little Australian book will be welcomed by all interested in the growing and use of herbs. After discussing fragrance and flavor, the author covers growing and harvesting; growing herbs indoors; fragrant gifts; traditions, culture and uses of 25 selected herbs; and herbal teas. Highly recommended.

HERBS; HOW TO GROW THEM, AND HOW TO USE THEM, rev. ed., by Helen Noyes Webster. Chas. T. Branford Co., 75 Union St., Newtown Centre 59, Mass. 1959. pp. 204. illus. The term "herb" is used here as defined by the Herb Society of America—"Any plant that may be used for pleasure, fragrance or physic." This is a comprehensive handbook on herbs and sums up a lifetime devoted to these plants by the late Helen Noyes Webster. After considering the history of the herb garden, chapters are devoted to important herb families and their genera; medicinal herbs; directions for herb gardens; commercial growing of herbs; drying and curing herbs; uses of garden herbs; cooking with herbs; herbs for modern gardens; and herbs of the Bible.

THE BOOK OF PLANTERS, by R. Scharff. M. Barrows & Co., 425 4th Av., New York 16, N. Y. 1960. pp. 191. illus. $3.50. This book is concerned primarily with the type of planter that can be used as an integral part of the decorative scheme of the house. The subjects discussed are portable and built-in planters; suitable plants for planters; interior and exterior planters; care of indoor plants; potting and repotting; and propagation. This is apparently the first book on the subject of planters.

IRIS FOR EVERY GARDEN, by S. B. Mitchell. rev. ed. M. Barrows & Co., 425 4th Av., New York 16, N. Y. 1960. pp. 216. illus. $4.95. This revised edition of the late Sydney B. Mitchell's 1949 edition was prepared by Molly Price, an eminent irisarian. After briefly considering culture and climate, the culture of various types of irises are discussed—bulbous, crested, beardless and bearded. Then follow discussions of the breeding and garden use of bearded irises; the standards for choice iris clones; and the oncocyclus and regelias. This is an excellent book for the American gardener.

THE FLOWER ARRANGEMENT CALENDAR, 1961, by Helen Van Pelt Wilson. M. Barrows & Co., 425 4th Av., New York 16, N. Y. The publishers sponsor an annual flower arrangement calendar contest. In this little book, some of the outstanding photographs of floral arrangements accepted by the publishers are reproduced in calendar form for 1961. This calendar will be most useful to those interested in flower arranging.

DARWIN'S BIOLOGICAL WORK, by P. R. Bell et al. Cambridge University Press, 32 East 57th St., New York 22, N. Y. 1959. pp. 343. illus. $7.50. This stimulating collection of essays, relating Darwin's work to research by later workers, show clearly the great range of Darwin's ability and interests as a biologist. The book includes discussions by P. R. Bell on the plants in response to light; J. Challinor on paleontology and evolution; J. B. S. Haldane on natural selection; P. Marler on animal communication; H. L. K. Whitehouse on cross- and self-fertilization in plants; and J. S. Wilkie on Buffon, Lamarck and Darwin with particular reference to the originality of Darwin's theory of evolution. This outstanding book is required reading for all biologists.

SEDUM OF THE TRANS-MEXICAN VOLCANIC BELT, by R. T. Clausen. Cornell Unversity Press, 124 Roberts Place, Ithaca, N. Y. 1959. pp. 380. illus. $7.25. Subtitled "An Exposition of Taxonomic Methods", this book represents the facts learned and the conclusions reached by the author after almost a quarter century of study. The region under consideration is "one both of great environmental diversity and of disjunction of similar habitats." Thus it serves for appraising the relative importance of the environmental factors in the origin of species. After covering the history of the study of *Sedum*, and the geology of the region, the species and culti-

vated hybrids are described in detail. This is followed by keys to the species, conclusions regarding the relationships of the species, comparison and evaluation of methods of taxonomic study, and conclusions. This outstanding book is recommended to all interested in biology.

THE CELL, by C. P. Swanson. Prentice-Hall, Inc., Englewood Cliffs, N. J. 1960. pp. 114. illus. paperback ed. $1.50; cloth ed. $2.95. This is one volume in a series of modern biology, each volume being complete in itself yet at the same time serving as an integral part of the series as a whole. The present volume is concerned with the cell. After considering the historical background, including exceptions to the cell theory; and the tools and techniques of cytology, the various aspects of the subject are discussed—cell shape, size, number, structure; cell division; the cell in reproduction; cell development; and the cell in death. This concisely and clearly written text is highly recommended to the student.

PLANT PROPAGATION, by H. T. Hartmann and D. E. Kester. Prentice-Hall, Inc., Englewood Cliffs, N. J. 1959. pp. 559. illus. $7.95. This is a stimulating new book on the principles and practices of plant propagation. The first part is concerned with general aspects—propagation structures; media; soil mixtures and containers. The second part is devoted to sexual propagation. The third part deals with asexual propagation, and the fourth part, with the propagation of selected plants. It should be noted that in the fourth part, the *fractional scale-stem* method for the propagation of amaryllis (also applicable to bulbs generally), has not been included (see Science 78: 532. 1933; The Amaryllis Manual, by H. P. Traub, Macmillan. 1958). This, however, is a detail that can be easily corrected in a future edition. On the whole this is an excellent presentation, and the book is highly recommended.

PLANT MORPHOGENESIS, by E. W. Sinott. McGraw-Hill Co., 330 W. 42nd St., New York 36, N. Y. 1960. pp. 550. illus. $12.50. The publication of this new book on plant morphogenesis by Dr. Sinnott is an important event for all plant scientists. After an introductory chapter to the subject, the various subdivisions are discussed in detail—growth in general, its cellular basis, and meristems; phenomena of morphogenesis, correlation, polarity, symmetry, differentiation, regeneration, tissue mixtures and abnormal growth; and the morphogenetic factors—light, water, temperature, physical factors, chemical factors in general, growth substances, genetic factors and organization. This stimulating, well-written book is highly recommended to all plant scientists.

BOTANY; A TEXTBOOK FOR COLLEGES, by J. B. Hill et al. 3rd ed. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1960. pp. 571. illus. $8.95. This third edition of a well-known text on plant science will be welcomed by teachers and students alike. After considering the distribution and importance of the plant kingdom, the remaining chapters are devoted to plant cells; coloration in plants; leaves; food synthesis; roots; absorption of water and inorganic substances; stems, growth and movement, flowers; fruits; seeds and seedlings; digestion, respiration, and fermentation, heredity; divisions of the plant kingdom, algae, bacteria, viruses, actinomycetes and slime molds; fungi; liverworts and mosses; and vascular plants—lower and higher groups. This attractive, well-written text is highly recommended.

INTRODUCTION TO PLANT GEOGRAPHY, by Nicholas Polunin. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1960. pp. 640. illus. $10.00. Written by an eminent plant scientist, this outstanding new text is concerned with plant geography and some related sciences. After considering plant geography in general, the author discusses the main groups of plant life; adaptations and life-forms; dispersal and migrations; evolutionary development; foundations of modern distributions; types and area of natural distributions; distribution of crops and weeds, and their economic importance; environmental factors; main habitats, succes ions and climaxes; vegetational types of temperate, polar and high altitude, and

tropical, lands; vegetational types of fresh and inland saline waters, and of the seas; landscapes and vegetation: and plant adjustments and applications. Highly recommended.

PHOTOCHEMISTRY IN THE LIQUID AND SOLID STATES, arranged by L. J. Heidt et al. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1960. pp. 174. illus. $6.00. This timely book on photochemistry is based on a symposium sponsored by the National Academy of Science and the National Research Council It contains contributions by a group of outstanding authorities in the fields covered. After the general introduction, the various contributions are grouped under photochemical reactions; photosensitized reactions; fluorescence; kinetic considerations; role of the triplet state; photochemical reactions involving chlorophyll; photoreactions in solids; and conclusions. This is required reading for photochemists and physical chemists; and also for all interested in solar energy, including applications to photosynthesis in plants.

ANATOMY OF SEED PLANTS, by Katherine Esau. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1960. pp. 376. illus. $6.95. This text was written mainly for students who have had relatively limited experience in plant study. It combines the clarity and conciseness which an introductory work should have together with the scholarly treatment of the subject that distinguished Dr. Esau's earlier *Plant Anatomy*. The developmental and functional viewpoint that characterized the earlier work is retained, and the selection of material fully takes into account the intensive research of the last decade in plant anatomy and related fields. Highly recommended.

BIOCHEMISTRY OF PLANTS AND ANIMALS, by M. F. Mallette, P. M. Althouse, and C. O. Clagett. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1960. pp. 552. illus. $8.50. Although this attractive text was prepared for undergraduates, it is also of interest to all others professionally concerned with biochemistry Part I is devoted to general biochemistry—history; properties of matter; carbohydrates; lipides; proteins; enzymes; and energy transfers and biological oxidations. Part II is concerned with plant biochemistry—plant structure and composition; plant metabolism; seed germination; plant nutrition; and growth regulation. Part III is devoted to animal biochemistry—body tissues; vitamins; mineral metabolism; feeds; digestion; carbohydrate, lipode and protein metabolism; and energy. Highly recommended.

PRINCIPLES OF GENETICS, by E. J. Gardner. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1960. pp. 366. illus. $7.50. Although this excellent text was written especially for the first course in college genetics, it is also of interest to plant and animal breeders, agricultural agents, and experiment station staff members. After a general introduction, the chapters are concerned with Mendel's experiments; probability; cells and heredity; interaction; multiple gene inheritance; sex chromosomes and sex linkage; linkage, crossing over and chromosome maps; chromosome structural modifications and position effects; sex determination and hormonal influence on gene action; chromosome numbers; mutations; alleles and compound loci; genes and their action; physiological genetics; population genetics; systems of mating; and applications in agriculture and human genetics. Highly recommended.

FOREST AND SHADE TREE ETOMOLIGY, by R. F. Anderson. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1960. pp. 428. illus. $8.50. The purpose of this excellent text is to provide the forestry and entomology student with a fundamental understanding of insect life, and also to prepare him to deal with actual forest insect problems. Section I is concerned with structure, physiology and development of insects; insect classification, ecology and control: insecticides: methods of applying insecticides and forest insect surveys. Section II is devoted to defoliating, inner-bark boring, wood-boring, sapsucking, bud-, twig-, and seedling-damaging, root-feeding, cone- and seed-destroying, insects. There is a host index, and an adequate general index. This is an outstanding text.

PRINCIPLES OF PLANT BREEDING, by R. W. Allard. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1960. pp. 485. illus. $9.00. This attractive text was written mainly for the undergraduate student in agriculture, and it is assumed that he has a genetic background equivalent to that found in standard texts. After considering introductory topics, the author discusses the genetic basis of breeding self-pollinated and cross-pollinated crops; breeding methods with self-pollinated and cross-pollinated crops; breeding for disease resistance; polyploidy in plant breeding; interspecific hybridization; mutation breeding; and distribution and maintenance of improved varieties. This stimulating book will be welcomed by the teacher and student.

MODERN INSECTICIDES AND WORLD FOOD PRODUCTION, by F. A. Gunther and L. R. Jeppson. John Wiley & Sons, 440 4th Av., New York 16, N. Y. 1960. pp. 284. illus. $8.50. This text is "designed to provide a general and comprehensive insight into the whys and wherefores of modern insecticides and acaricides, the problems of, and arising from, their use." After considering the insect and its hosts, the authors discuss methods of insect control; modern insecticides; effectiveness of insecticides; formulation and application of insecticides; deposits and residues; resistance of insects to chemicals; acaricidal, organochlorine, and organophosphorus compounds; petroleum products; botanical, fumigant, soil-treatment, and other insecticidal compounds; and attractant and repellent compounds. The appendices are devoted to the approx. mammalian toxicities of insecticides; originators of modern insecticides; and Latinized names of pests mentioned in the text. Highly recommended.

COMMERCIAL HYDROPONICS, by Maxwell Bentley. Bendon Books (PTY) Ltd., P. O. Box 62, Orange Grove, Johannesburg, S. Afr. 1959. pp. 750. illus. 15 pounds; 15 shillings. This limited edition was written to serve as a guide to those interested in the future of hydroponics on a commercial scale, with particular reference to South Africa. Part I is concerned with the system and crop notes; Part II with operational details; Part III with facts and figures; Part IV with constructional details; Part V with nutrient solutions—their make-up and control; and Part VI with water control. The volume is notable for the many excellent illustrations, including some color plates.

THE BEST OF REDOUTE'S ROSES, selected by Eva Mannering. Viking Press, 625 Madison Av., New York 22, N. Y. 1959. Pierre-Joseph Redouté produced his magnificent folios "Les Roses" from 1817 to 1824 from living roses provided by the Empress Joséphine from her extensive collection at Malmaison. The present volume, 11¾" x 16", contains reproductions of twenty-nine outstanding color portraits of roses from Redouté's folios as selected by Eva Mannering. These are prefaced by a section giving the original text descriptions from Redouté. This is a most charming volume that will appeal to all gardeners. Highly recommended.

WATER AND AGRICULTURE edited by R. D. Rockensmith. American Association for the Advancement of Science, 1515 Massachusetts Av., N. W., Washington, D. C. 1960. pp. 206. 21 illus. Index. $5.00. The papers included in this symposium were presented by thirteen outstanding authorities at the 1958 meeting of the American Association for the Advancement of Science. The discussions deal primarily with water and agriculture, and other phases of water are considered only in so far as they are associated with water or agricultural uses. Part I is devoted to water for the future; Part II, to water sources; Part III, to water planning and use; and Part IV, to methods and techniques of water control. This important book is highly recommended to all interested in water in connection with agriculture.

[PLANT LIFE LIBRARY, continued on page 75.]

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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[Affiliated with the American Plant Life Society]

[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

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Correspondence about the registration of plant names should be sent directly to Mr. Morton, 3114 State St., New Orleans, La. and a self-addressed, stamped envelope should be enclosed if a reply is expected.

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This is required reading for every amaryllid enthusiast.

2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $2.50 postpaid.

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PLANT LIFE

VOLUME 17

[Nos. 1-4, Jan., Apr., Jul. & Oct.]

1961

EDITED BY

HAMILTON P. TRAUB

HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY

Box 150, La Jolla, California

Printed in the United States of America

Citations to this issue of PLANT LIFE should read as follows: PLANT LIFE *16: —— — ——, 1961.*

Address correspondence and send membership dues to:

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TABLE OF CONTENTS

Cover design by Douglas D. Craft is based on *Amaryllis reticulata* var. *striatifolia* as grown by Mr. Craft at Chicago, Illinois.

PLANT LIFE, VOLUME 17, NO. 1, 1961—AMARYLLIS YEAR BOOK
GENERAL AMARYLLID EDITION

3. GENETICS AND BREEDING

4. AMARYLLID CULTURE

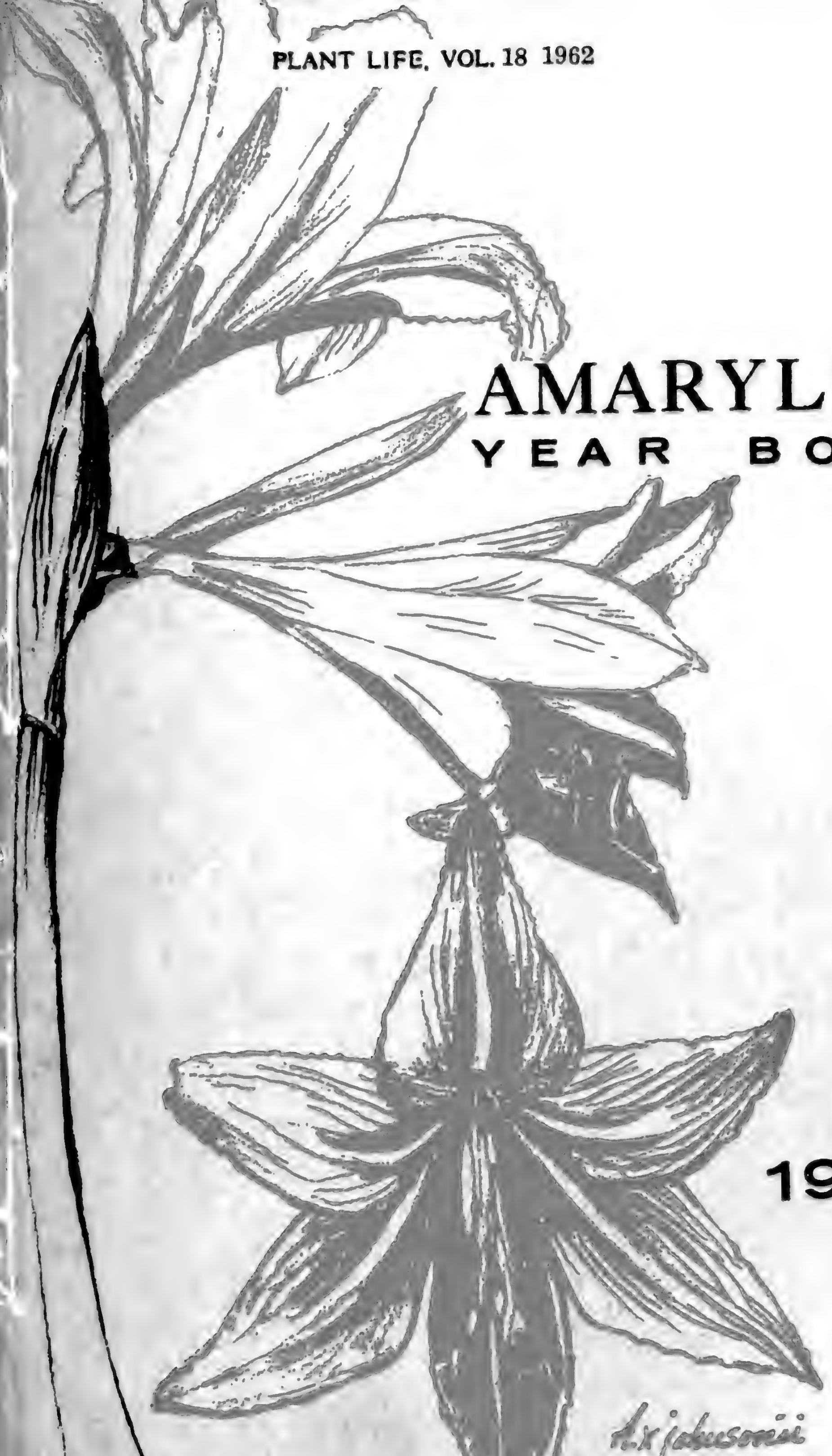
PLANT LIFE, VOLUME 17, NOS. 2—4, INCL, 1961
GENERAL EDITION

Page

ILLUSTRATIONS

PLANT LIFE, VOL. 18 1962

AMARYLLIS
YEAR BOOK



1962

THE AMERICAN PLANT LIFE SOCIETY

THE AMERICAN PLANT LIFE SOCIETY is organized for the "increase and diffusion of knowledge concerning plant life," and to carry out its objectives the main emphasis is placed on the publication of PLANT LIFE, the periodical devoted to plant life, incl., HERBERTIA, the yearbook devoted exclusively to the amaryllids, sponsored by the affiliated AMERICAN AMARYLLIS SOCIETY. The publications are international in scope. All paid up members are privileged to receive the current issues of PLANT LIFE, incl., HERBERTIA.

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MANUSCRIPTS AND PHOTOGRAPHS. To insure against loss in the mails, authors should *retain copies* of manuscripts and the *original negative or extra prints* of photographs sent for publication in PLANT LIFE, incl., HERBERTIA. Photographs should have the *name and address* of the owner to whom credit should be given, and the *name and size* of the subject, written on the back.

All editorial correspondence should be addressed to: Hamilton P. Traub, *Editor, The American Plant Life Society*, 5804 Camino de la Costa, La Jolla, Calif.

All persons and organizations interested in amaryllids, and other plants are invited to become members. The annual dues vary from $4.00 to $5.00 (foreign, $5.00 to $6.00) depending on the publishing costs. At present they are $4.00 (foreign $5.00) in advance which should be sent to:

DR. THOMAS W. WHITAKER, *Executive Secretary*
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PLANT LIFE

VOLUME 18

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THE AMERICAN PLANT LIFE SOCIETY

Box 150, La Jolla, California

Printed in the United States of America

Citations to this issue of PLANT LIFE should read as follows: PLANT LIFE *18: —— — ——, 1962.*

Address correspondence and send membership dues to:
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TABLE OF CONTENTS

Cover design by Douglas D. Craft is based on *Amaryllis* x *Johnsonii* as grown by Prof. Craft at Chicago, Illinois.

PLANT LIFE, VOLUME 18, NO. 1. 1961—AMARYLLIS YEAR BOOK
GENERAL AMARYLLID EDITION

ILLUSTRATIONS

SUPPLEMENT

PLANT LIFE, VOL. 18, NO. 1, January, 1962

AMARYLLIS
YEAR BOOK
1962

Year Book of
The American Amaryllis Society
29th issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

THE AMERICAN PLANT LIFE SOCIETY

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 163.]

PREFACE

The cover design, featuring *Amaryllis* x *johnsonii*, is the work of Prof. Douglas D. Craft of THE DEPARTMENT OF DESIGN, ART INSTITUTE OF CHICAGO It is based on a plant grown by Prof. Craft. We are all grateful to him for this contribution.

The 29th edition of THE AMARYLLIS YEAR BOOK is dedicated to Dr. Floyd F. Smith, an outstanding scientist in the field of entomology, who received the 1962 HERBERT MEDAL for his contributions toward the description and control of the mite and insect pests of Amaryllis and the other amaryllids (see Plant Life 10: 91—95. 1954). Dr. Smith contributes an interesting autobiography in the present issue. His additional paper on the control of mite and insect pests was received too late for inclusion in this issue and will appear in a future edition. We are all grateful to Dr. Smith for the assistance that he has given to all of those interested in *Amaryllis* and the other amaryllids.

Mr. Percy-Lancaster writes on his South African travels in the present issue. He is now back at the National Botanical Gardens, Lucknow, India, as Technical Advisor in charge of a School of Plant Breeding and Genetics. He will write from there hereafter.

The articles on *Amaryllis* in the present issue are most interesting. Prof. Craft writes on *Amaryllis* x *johnsonii;* and Dr. Cardenas describes a new Bolivian *Amaryllis.* Mr. Stevens reports on the Blue Amaryllis as grown in New Zealand. Mr. Quinn Buck writes on the culture of *Amaryllis calyptrata;* and Mr. Cooper on the naturalized *Amaryllis striata* in Hawaii. Mr. Goedert reports on the *Amaryllis* hybrids and species of the 1960-61 season. Mr. Hill writes on bottom heat for *Amaryllis* and Mr. Turner on treating *Amaryllis* bulbs and soils. Mrs. Williams, Miss Stewart and Mrs. Harris report on their experiences in growing *Amaryllis.* Dr. Joseph C. Smith contributes notes on *Amaryllis* species. Mrs. Seale writes on *Amaryllis* arrangements for the home.

There are interesting articles on the other amaryllids. Mr. Wallace contributes articles on *Boophone disticha*, *Brunsvigia josephinae* and Nerines as grown in the San Francisco area. Mr. Morris writes on collecting *Crinum flaccidum* in Australia. Mr. Rokujo reports on *Crinum asiaticum japonicum*, and Mr. Hannibal on the breeding of Crinums. There is a report on the finding of a long lost *Crinum* within the City limits of Beaumont, Texas, by Mrs. Carl Shirley. Miss Dorman and Mr. Woelfle write about *Hymenocallis.* Mr. Hansberry reports on west coast *Vallota* culture; Mr. Woelfle on the miniature amaryllids; Mr. Brasol on breeding *Zephyranthes;* and Mr. McNeil on *Cyrtanthus* hybridizing. Mrs. Fred Flick contributes extracts from the Amaryllis Round Robin letters.

Dr. Ising contributes a valuable article on cromosome balance in *Cyrtanthus;* and Drs. Flagg and Flory write on the placement of *Sternbergia.* There are articles on the subfamilies and genera of the *Amaryllidaceae*, and the classification of *Hymenocallis.*

There are reports on the Official Amaryllis Shows for 1961; and

Mrs. Pickard writes on "The Amaryllis Parade". There are various other interesting items.

Contributors for the 1963 issue of THE AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1962, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past several years. Your cooperation toward earlier publication will be greatly appreciated.

December 12, 1961,
5804 Camino de la Costa,
La Jolla, California.

Hamilton P. Traub
Harold N. Moldenke

CORRIGENDA

PLANT LIFE, Vol. 17. 1961

Page 43, 12 lines from top, for the first "flowers" read "leaves".
Under *Calostemma purpureum* var. *purpureum*, 14th line, for "1-seeded" read "1-, rarely 2, seeded,"

Page 50, delete 9th line from top beginning "Allium saxicola etc."

Page 160, under "GLORIOSA L.", end of 1st line, for "Abyssinica" read "Abyssinia".

[PLANT LIFE LIBRARY, continued from page 162.]

MAKERS OF NORTH AMERICAN BOTANY, by H. B. Humphrey. Ronald Press Co., 15 E. 26th St., New York 10, N. Y. 1961. Illus. pp. i-ix + 265. $6.00. This interesting book includes brief biographies of 122 North American botanists, from colonial to the present times. Those included were selected for their important contributions toward the advancement of plant science, particularly for outstanding research, teaching, or effectiveness in administration. There are some omissions - W. W. Garner (photoperiodism), R. B. Harvey (plant physiology), etc., but these can be added in a future edition. This is a reference book which all plant scientists will want to have in easy reach. Highly recommended.

ADVANCES IN AGRONOMY, Vol. 13. Edited by A. G. Norman. Academic Press, 111 5th Av., New York 3, N. Y. 1961. Illus. pp. 386. $12.00. This is volume 13 in a series designed to review research progress in soil and crop sciences and development in agronomic crop practice. The present volume includes contributions by outstanding authorities on podzol and podzolic soils; subterranean clover; stubble mulch farming; contamination of soils by petroleum hydrocarbons; the barley yellow dwarf virus disease of small grains; the abundance of earthworms and their possible significance in agriculture; physical chemistry of clay-water interaction; and iron chlorosis in plants. This attractive book is highly recommended to all who are interested in crop production.

BIOLOGY: AN INTRODUCTION TO THE SCIENCE OF LIFE, by C. J. & Marie L. Goodnight, and R. R. Armacost. John Wiley & Sons, 440 Park Av., S., New York 16, N. Y. 1961. Illus. pp. 460. $6.95. This course in biology offers a clear and concise survey of the major features of the plant and animal kingdoms. Following the introductory section, the subject is presentel in four parts human anatomy and physiology with the principle of homeostasis as an integrating concept; structure and functioning of higher plants, and a survey of the plant kingdom; the principal types of animals, with particular reference to adaptation and anatomy; and reviews of material previously presented from the viewpoint of genetics, evolution, ecology and conservation. This stimulating text is highly recommended.

[PLANT LIFE LIBRARY, continued on page 5.]

DEDICATED TO

FLOYD FRANKLIN SMITH, PH.D.

[PLANT LIFE LIBRARY, continued from page 4.]

AN OUTLINE OF CHEMICAL GENETICS, by B. S. Strauss. W. B. Saunders Co., W. Washington Sq., Philadelphia 5, Pa. 1960. Illus. pp. 188. $5.00. The purpose of this excellent book is to emphasize the effect of recent advances in genetics, particularly those pertaining to nucleic acids, on genetic theory as a whole. Chapters are devoted to the genetic control of protein synthesis, the chemical nature of the hereditary material, the molecular meaning of genetic recombination, mutation as a chemical process, nucleo-cytoplasmic relationships and the problem of protein synthesis, and the biochemical genetics of man. Highly recommended.

GARDENING IN BRITAIN, by Miles Hadfield. Chas. T. Branford Co., Newton Centre 59, Mass. 1960. Illus. pp. 483. $12.00. This is the book on British gardening that we have all been waiting for. How often in the past has one sought for a single source on this subject! Now this need has at long last been met in Mr. Hadfield's handsome volume. The subject is presented in a charming style and a wealth of detail, and the sixteen illustrations are outstanding. Chapter one discusses British gardening from ancient times to 1529, and in the next seven chapters the subject is carried by historical stages to 1939. This book is highly recommended and the reader should not hesitate to acquire it at the first opportunity. Britain is the mother of gardening and this book will illuminate the beginnings of our own gardening tradition.

A HISTORY OF BIOLOGY, by Charles Singer. 3rd revised ed. Abelard-Schuman, 6 West 57th St., New York 19, N. Y. 1959. Illus. pp. i—xxxvi + 580. $6.00 The purpose of this attractive book is to give in simple language a critical survey of the historical development of biological concepts to about 1900 which is to serve as an introduction to living things. Following the opening section, the book is divided into three parts—the rise of ancient science, the historical foundation of modern biology, and the emergence of main themes of modern biology. There is one important omission—Michel Adanson who first enunciated the multivariate principle in systematic biology. Dr. Singer, an outstanding authority in biological history, who died in 1960, approached the subject from a dynamic point of view—biology as a developing science—and thus produced a sound critical survey. This revised edition of a stimulating book is highly recommended.

[PLANT LIFE LIBRARY, continued on page 13.]

Herbert Medalist — Floyd Franklin Smith, Ph.D.

FLOYD FRANKLIN SMITH, Ph.D.

An autobiography

I was born July 27, 1900, on a farm in Hinckley Township of Medina County, Ohio, and was the oldest of six children. School grades one through eight were spent in a one room district school. During the first two years I was one of the total of six children enrolled in the school. On two blizzardy days during the first school year I was the only pupil in attendance (no closing of schools in those days). As a small boy I had an intense interest in wild plants and trees and for several years maintained a wild flower garden and a garden of lichens and mosses collected from the woods. Graduating from Hinckley High School in 1918, I enrolled in the Students Army Training Corps at Wooster College which disbanded after the close of World War I. The following year I enrolled in the College of Agriculture at Ohio State University majoring in entomology with a minor in horticulture. During the summer vacation periods I worked as field assistant in the study of insect transmission of raspberry viruses at a USDA laboratory in northern Ohio. In 1923 I graduated with a B.Sc. degree and also married the prettiest black haired gal, Dorothy Louise Kuder, whom I first saw getting a drink at the town pump on my first day of high school 9 years previously. I continued graduate studies and served as graduate instructor in zoology at Ohio State. After receiving a Master of Science degree in 1924, I accepted an appointment with the Pennsylvania Bureau of Plant Industry and we moved to Willow Grove, near Philadelphia. One third of my time was devoted to nursery inspection and the remainder to research on greenhouse and nursery pests. Insects of chief interest were the boxwood leaf miner, the black vine weevil, and pine shoot moths. But a number of insects new to science or new to America were discovered, including the bulb scale mite in imported narcissus bulbs. Through association with a fellow worker, Arthur B. Wells, who was an excellent botanist, I learned to recognize a vast number of ornamental plants and trees grown in commercial nurseries and greenhouses, and also in conservatories and grounds of the numerous great private estates in the Philadelphia area. During this period I pursued post graduate studies *in absentia* and in 1928 I was awarded a University Fellowship in Entomology at Ohio State University. After spending the following year in graduate studies in chemistry, plant physiology, plant ecology, and insect parasitism, I was awarded in 1929 the Ph.D. degree.

In the same year I was appointed an associate entomologist in the United States Department of Agriculture laboratory of Dr. F. W. Poos at Arlington Farms across the Potomac River from Washington, D. C. With Dr. Poos I investigated the nature of the injury produced on various crops by feeding activities of the potato leafhopper and related species.

In 1931 I was appointed entomologist in the Division of Truck Crop and Garden Insect Investigations, a unit of the Bureau of Entomology

and Plant Quarantine of the U.S.D.A. There, in Washington, under the direction of Dr. C. A. Weigel, I investigated many pests of ornamentals and devoted particular attention to the life history and control of the cyclamen mite. For several years after the arrival of the gladiolus thrips in this country I devoted considerable time along with other entomologists in our group to studies and life history and control of this insect both in the field and under storage conditions. The tartar emetic-sugar sprays, the standard treatment for several prewar II years was later replaced by DDT or one of the other new organic compounds. In recognition of the research contribution that helped save the gladiolus flower for the average gardener, the New England Gladiolus Society awarded me its Gold Medal in 1949.

In 1935 the project on greenhouse and ornamental insects was transferred to the Agricultural Research Center at Beltsville, Maryland, where more greenhouse and laboratory space was provided and investigations on greenhouse pests was expanded. I cooperated with chemists on the aerosol method of insect control in both the field and the greenhouse. With the advent of newer insecticides such as DDT, hexaethyl tetraphosphate, parathion, and many others, and their use in aerosols, smokes and sprays, higher and higher levels of pest control were achieved. Because of these accomplishments I was given the Award of the Society of American Florists for the Outstanding Research Contribution to Floriculture in 1947.

Interest in insect transmission of plant diseases began in 1922 as a temporary employee of USDA on raspberry diseases. In experiments we discovered that the mysterious dying of blackcap raspberries was due to aphids infecting them with a mosaic from red raspberries growing nearby. In 1932 I first became associated with Dr. Philip Brierley, a plant virus disease specialist, in a pooling of talents against several virus diseases of ornamentals. Included in our joint studies, which have continued to the present time; were the virus diseases of iris, lilies, tulip, chrysanthemum and gladiolus. Through our combined efforts the necessary knowledge of several diseases was developed so that commercial growers could successfully combat them and maintain or increase their production.

Current problems under investigation are the viruses of gladiolus and chrysanthemum.

While continuing in the service of the U.S.D.A. at Beltsville I was promoted to Senior Entomologist in 1944, Principal Entomologist in 1954, and in 1960 to Investigations Leader in the section on insects affecting ornamentals and vegetable crops. These advancements have brought their administrative responsibilities but have left considerable opportunity for continuing with research activities. Especially satisfying, however, is the opportunity to work with younger research entomologists in our group who are energetically attacking new insect problems. During this period I have been author or co-author of about 230 bulletins and papers.

In 1935 we built our home in Woodside Park, a community in Silver Spring, Maryland, where on our half acre of fine soil, I have raised

many kinds of flowers, bulbs and shrubs which incidentally enable my wife to follow her hobby of flower arranging, an art in which she has earned a considerable reputation as exhibitor, teacher and judge. Our son, Dwight Raymond, who graduated in medicine from the University of Chicago, has established his practice in surgery in the Washington area. Our daughter, Margaret Isabel, the wife of an architect, is an accomplished pianist.

This briefly outlines my research and related activities for the past 38 short years. I can only briefly refer to the most pleasant personal experiences from association with other entomologists and with scientists in related fields of plant pathology, chemistry and physiology, while exploring together the ways of insects and the possibilities of control. In the early years the challenges were great because we had few tools (insecticides) to work with. Then, for a short while, the powerful new insecticides resulted in such spectacular slaughter of the insect hordes that great ingenuity was not required. Today, however, with the development of resistance to insecticides in many of our important insect

I had heard of the beauties of South African flora time and time

species we are faced with new challenges to maintain our high standards of control. But new approaches to insect control now on the horizon, such as irradiation and chemosterilants that effect the reproduction of insects are opening up new possibilities in research. The future looks exciting and makes one wish to be starting over again.

SOUTH AFRICAN TRAVELS, 1960

SYDNEY PERCY-LANCASTER, *Southern Rhodesia*

again but it was only in September-October, 1960, that I had the opportunity of seeing for myself some of the gems of that country. On the 23rd September I left Salisbury, by Comet, for Johannesburg on the first lap of the journey that would take me to Cape Town. I spent the next two days in seeing the sights of this City and visiting gardens and parks, as well as nurseries. What gave me most pleasure was the collection of tropical plants in the glasshouses of the Public Park, many I had not met before. My Doctor son drove up from East London and, before going south, we spent a day in Pretoria.

The main Highway in South Africa is very good; awkward curves, and very few exist, are being straightened out so that one can drive at 50 miles per hour; we often touched 70, but had to conform to the rules of 35 m.p.h. near towns. Stopping for a night en route we easily did the 627 miles in two days, though it gave us little time to admire the flora. *Arctotis* and *Gazania* in variety were weeds of the roadside. In the drier parts we met with clumps of *Aloe* and small forests of tall *Euphorbia*, while hardy shrubs, most noticeable being *Acacia Karroo*, with 2½ to 3 inch thorns, grew in stony land. *Argemone* of a pale creamy shade has apparently invaded Africa while *Opuntia*, in two or three species, was also met with near coastal towns. One of the amenities provided by a thoughtful Government is the provision of cement

seats and tables, placed in the shade of trees, for the benefit of travelers. We passed many picnic parties on our way to the Cape, in fact we had a lunch at one of these convenient spots. Among the trees used for avenues were *Grevillea robusta*, leafless & therefore a wonderful sight with masses of orange yellow flowers, a scarlet *Brachychiton* was also very noticeable, as were the flowering *Eucalyptus* in shades ranging from red to a creamy white. *Jacaranda* was in bud and *Erythrina caffra* just over. One of the bushes that attracted our attention was *Erythrina acanthocarpa*, three feet high and carrying large sprays of scarlet tipped greenish-yellow flowers.

I spent a very happy eleven days in East London with my son and family, enjoying the wonderful sea beaches and the gardens, and then, on the 10th October, my son and I left for Cape Town where he had to attend a Medical Congress. We drove the 995 miles by car and it was a most pleasant journey which took us two days to accomplish. The Highway leads along the east coast of S. Africa, more or less parallel to the sea; and the frequent sea views, the picturesque towns, and the flowers, were all interesting. One of the noted bridges is over the Storm River, this is an arched concrete structure, 630 feet long spanning a 330 foot deep chasm. The scenery in the vicinity of two Passes, Blaukras Pass and Grootriver Pass, reminded me of the lush tropical growth one meets on the way to Darjeeling, or to Kalimpong. It was in a deep damp gully that I saw what looked like thin stemmed *Ravenala madagascariensis* but proved to be a *Strelitzia*, *S. nicolai*, twenty to thirty feet high, with flowers of no floral beauty. *S. reginae* was not seen wild but, in many of the towns we passed through, it had been used as a boundary hedge and the Municipal Corporation had planted long rows to form a demarcating fence between "up and down" traffic lanes. Traffic islands were invariably decorated with *Pelargonium*, *Mesembriathemum*, and many other free flowering plants. Stops by the wayside had to be limited as we were pressed for time ana we got to Constantia, a suburb of Cape Town, late in the evening of the second day. Pelargoniums and geraniums were everywhere en route, the ivy-leafed types rambled over tall bushes, the zonal were in drifts, or solitary bushes; the dwarf, growing only six inches or so above ground, were very deeply rooted. *Pelargoniums* spread in dense carpets close to the Highway and one with mauve flowers, the size of a shilling, was especially attractive. *Plumbago capensis* was a ragged bush seen everywhere and *Tecomaria capensis* looked very bright in full bloom. I missed, however, *Bauhinia galpinii*, which is one of the attractive rambling bushes seen from the Railway all the way up from Beira, in Mozambique, to Salisbury.

At Tzitzikama, the Government has a huge Forest Experimental Reserve with indigenous and introduced species useful for timber purposes. South Africa has a very ambitious scheme for planting trees of economic value and you meet with forests of *Eucalyptus*, *Podocarpus* and *Pinus* every here and there. We spent three days with a friend in Cape Town and I was shown the sights of this great city. One day we

visited Protea Gardens, enjoyed the various plants in bloom and here I saw a *Fatsia papyrifera*, 12-15 feet high, and a large specimen of *Paulownia imperialis* in full flower. I also took the opportunity of seeing the National Botanic Garden at Kirstenbosch but, unfortunately, we picked on the lunch hour for our visit and missed the chance of obtaining a guide to show us round the extensive grounds. I also spent an hour in their Herbarium noting the specimens of *Gloriosa* in their collection. Our return trip from Cape Town was on Saturday the 15th of October, and we reached East London late on Sunday night. We had spent the night at Riversdale and made frequent stops to examine interesting flora. I spent the next two days with my son and family intending to leave on the 18th but, owing to high winds, the plane could not touch down that afternoon and I left the following day. The first call was Durban, then we landed at Johannesburg airport about 7 p.m. Three days were spent in seeing gardens and the suburbs that I had failed to visit on my first trip. I caught the plane to Salisbury on the 23rd and a couple of hours later was in Southern Rhodesia, just a month from the date I left. I had travelled 2700 miles by road and some 1025 by plane.

A motor trip, unfortunately, takes you down only a corridor from East London to Cape Town, more or less parallel to the sea, and all the plants one sees are those growing close to the Highway, or in gardens. The wet weather in Cape Province had been the worst for forty years and many plants were not in flower. The Calla Lily, *Zantedeschia*, was seen in drifts in swampy land, and *Kniphofia* too in small clumps. Any amount of *Plumbago* was met with, but ragged and an apology for itself. The Compositeae were well represented, many I failed to recognise, but specimens of the following were identified:—*Arctotis, Dimorphotheca, Gazania, Helichrysum, Ursinia* and *Venidium*. Others met with were *Cotula, Chaeris, Felicia, Heliophila, Matricaria, Osteospermum, Senecio* and *Vernonia*. *Agapanthus* was seen in clumps and the variety of Irideae was large and interesting. Except for two dwarf species of *Gladiolus*, the great majority had finished flowering. *Moraea* in white and blue, *Aristea* in blue, and *Watsonia* in a great range of colours was in bloom. White *Ornithogalum*, a tall, as well as, a dwarf species, was met with in drifts and sometimes among the white species *O. aureum*, with orange flowers, appeared. *Scilla* with dull greenish flowers, so often seen, could not compare with *S. natalensis* with blue flowers. Only one clump of *Clivia nobilis*, several *Lachenalia*, and an uninteresting species of *Haemanthus*, having the dull red flowers crowded together between two green bracts, were seen in East London. The only *Crinum* met with was *C. Macowanii*, in East London, but in Salisbury we have this, as well as another that looks like *C. bulbispermum*. In our garden we also have a specimen of *C. graminicola* that unfortunately does not have a long enough flower stem to display to advantage the twenty pink flowers this species produces. *Oxalis* are numerous in S. Africa but are liable to become weeds if permitted to grow unchecked. Among bushes the following were outstanding:—*Erythrina acanthocarpa, Rhigozum*

obovatum, with large yellow flowers, *Cadaba juncea*, *Greyia Sutherlandii* (only seen in Nurseries), and *Virgilia divaricata*. There must be dozens, perhaps with more interesting flowers, but they were not in bloom. *Asclepias* are weeds of which there are dozens of species, some are worth cultivating for their flowers but all have quaint seed pods to recommend them. Among terrestial orchids I saw just a few in bloom, these were varieties of *Lissochilus*, *Satyrium*, and *Corycium*. *Mesembrianthemums*, *crassulas*, *aloes*, and succulents of various kinds, were seen all the way from Johannesburg to Cape Town.

EDITOR'S MAIL BAG

Under date of June 26, 1961, Mr. W. M. James, of Saratoga, Calif., writes,—"*Cornus nuttallii* grafted on *C. capitata* is apparently going to bloom in summer instead of the spring. It had flowers last summer and buds are setting heavily now (June 1961). Normally *C. nuttallii* sets buds in the fall. It is deciduous and *C. capitata* is evergreen, and just in bloom now. There is a fine tree of *C. capitata* near here. It should be planted more than it is."

Mr. Howard F. Cooper, Hana, Maui, Hawaii, writes under date of Sept. 4, 1961, that he "will be away for 2½ weeks with the U. S. Air Force in the Phillipines and Japan (action duty), and will return to Hana on or about the 25th of September."

Dr. Thad Howard of San Antonio, Texas, made a short trip to California this spring and stopped off at the writer's home for a very brief visit which was all too short.

Dr. Leo Brewer, of Lawrence Radiation Laboratory, Berkeley, was among those who received the Ernest Orlando Lawrence Memorial Award in 1961. The Award consists of a Medal and a $5,000 cash award, selected by the Atomic Energy Commission's General Advisory Council.

The members will be interested to hear that our Artist, Douglas D. Craft, has been promoted to the rank of Assistant Professor, in the Department of Design, Art Institute of Chicago.

The writer had the privilege of welcoming the amaryllidarians, Miss Irene Stewart and Mrs. Flickinger of Escondido, Calif., to his garden in June of 1961.

On September 30, 1961, Mrs. Leonard Swets, the amaryllid enthusiast of Riverside, California, and her sister, paid us a visit, which was most enjoyable. She brought along a fine flowering scape of *Brunsvigia orientalis* which she donated to the Traub Herbarium for a specimen. Mrs. Swets is apparently the only one to have grown this subject successfully in the United States.

The following information was furnished to Wyndham Hayward by Dr. W. Monke, Director, Botanical Garden and Museum, Berlin-Dahlem, Germany:

Dr. Herman Harms, Prof. at the Akademie der Wissenschaften, Berlin, born Sept. 16, 1870; died Nov. 27, 1942.

Dr. Ferdinand Pax, Prof. of Botany, University at Breslau, born Jan. 26, 1853; died Mar. 1, 1942.

Dr. Mez, Prof. of Botany, Univ. at Koenigsberg, born Mar. 24, 1866; died Jan. 15, 1944.

Miss Kaethe Hoffmann, Instructor at Breslau, later at Berlin. Date of birth not known; died Dec. 30, 1960. (Co-author with Dr. Pax of the Amaryllidaceae in Engler & Prantl, Nat. Pflanzenfam. 1930.)

Mr. Barry W. Clark, 2455 Benefit St., New Orleans 22, La., writes that he is collecting *Amaryllis* species, but he has difficulty in obtaining some of those now under cultivation. He will exchange when his stock permits.

The writer enjoyed a visit by Mr. Burr Clouette, 202 Toro Ave., Salinas, Calif., on Oct. 18, 1961. Mr. Clouette is an enthusiastic amaryllidarian.

Mr. Gerald E. De Vries, 117 E. Bolton St., P. O. Box 225, Savannah, Georgia, visited with the writer on November 10, 1961. Mr. De Vries is an Amaryllis enthusiast, and is interested in helping to organize Amaryllis Clubs. His visit was most enjoyable.

We are saddened to report that A. Percy-Lancaster, of Salisbury, Southern Rhodesia, passed away Sept. 28, 1961. He was the son of Sydney Percy-Lancaster, F. L. S., and was working on the Gloriosa Breeding Project (see pp. 158—162, 1961 PLANT LIFE) with his father.

[PLANT LIFE LIBRARY, continued from page 5.]

RHODODENDRONS AND AZALEAS, by C. G. Bowers. 2nd edition. Macmillan Co., 60 5th Av., New York 11, N. Y. 1960. Illus. pp. 525. $25.00. This second edition of Bowers' classic volume on the "origins, cultivation and development" of Rhododendrons and Azaleas will be generally welcomed. The text has been brought up-to-date. The original 26 color plates and 83 other illustrations have been retained and 2 new color plates have been added. New information on nutrition, physiology and propagation has been added. The subject is presented in a charming literary style, and the book represents a vast mine of information for scholars and technicians and also for the practical gardener and landscape architect. Very highly recommended.

ESSENTIALS OF EARTH HISTORY, by W. L. Stokes. Prentice-Hall, Englewood Cliffs, N. J. 1960. Illus. pp. 502. $8.75. This book is designed (1) to acquaint the reader with the aims, methods and materials of the subject; (2) to present in outline form the essentials of the earth's history, and (3) to point out some of the most significant and meaningful inferences and generalizations that can be drawn from the subject. This attractive, well-written and profusely illustrated introduction to historical geology is highly recommended to the student and general reader. Highly recommended.

THE LIFE OF THE GREEN PLANT, by A. W. Galston. Prentice-Hall, Englewood Cliffs, N. J. 1961. Illus. pp. 116. Paperbound, $1.50; clothbound, $2.95. In this book the life of the green plant is detailed in five sections—the green plant in the economy of nature, the green plant cell, plant nutrition, plant growth, and differentiation and morphogenesis. This well-written and well-illustrated text is highly recommended.

ADAPTATION, by B. Wallace and A. M. Srb. Prentice-Hall, Englewood Cliffs, N. J. 1961. Illus. pp. 113. Paperbound, $1.50; clothbound, $2.95. The objective of this book is to explain how adaptation occurs. The subject is presented in sections —the basis of adaptation, heredity, genetic variation in populations, simple adaptations, more complex adaptations, similarities and dissimilarities between species,

mutual adaptations of living things, modification of reproductive behavior, individual adaptations, and the limitation of adaptation. This stimulating text is highly recommended.

HEREDITY, by D. M. Bonner. Prentice-Hall, Englewood Cliffs, N. J. 1961. Illus. pp. 112. Paperbound, $1.50; clothbound, $2.95. The discussion of heredity in this volume is centered around the gene. The subject is presented in sections—the material basis of heredity, the genetic material, genes and biochemical reactions, genes and enzymes, genes in action, the molecular structure of a gene, genetic mechanisms, genes and man, genes and development and heredity and Hiroshima. This stimulating book is highly recommended.

PLANT LIFE, by L. J. and Margery Milne. Prentice-Hall, Englewood Cliffs, N. J. 1959. Illus. pp. 283. $6.75. This stimulating text emphasizes the dynamic aspects of plant science. The authors present a concise, comprehensive discussion of all phases of the subject. The book is profusely illustrated.

SYNTHESIS OF MOLECULAR AND CELLULAR STRUCTURE, edited by Dorothea Rudnick. Ronald Press Co., 15 E. 26th St., New York 10, N. Y. 1961. Illus. pp. 252. $9.00. Nine authorities have contributed to the eight studies included in this volume. The subjects include the physiochemical behavior of nucleic acids; the possibilities of adaptive control of enzyme activity in higher animals; the cell wall in relation to protoplasmic chemistry in plant root tips; the analysis of induction, orgin of competence, and differentiation of cartilage and muscle; the chemical and ultrastructural development of the basement lamella; induced differentiation of tissue within animal organ culture; control of growth and differentiation in plant tissue cultures, and the influence of endocrine and other physiological factors on regeneration in larval Amphibia. Highly recommended.

MOSSES, FERNS, CONIFERS, HORSETAILS, LYCOPODS—PHYLOGENY, by Olaf Hagerup and Vagen Petersson. Ejnar Munksgaard. Copenhagen, Denmark. 1960. Illus. pp. 299. Dan. Kr. 76. This is Volume II of "A Botanical Atlas", and includes excellent drawings of about half of the Danish mosses and liverworts, and all of the Danish ferns, locopods, horsetails and conifers. Besides the adequate text accompanying the drawings, there is a discussion of the phylogeny of plants from algae through angiosperms, including the origin of the seed. The text is in Danish and English (translated by H. Gilbert-Carter). The numerous drawings are outstanding. This volume is indispensable to all who are interested in plants, and it cannot be too highly recommended.

GERM PLASM RESOURCES, edited by R. E. Hodgson. A. A. A. S., 1515 Mass. Av., N. W., Washington 5, D. C. 1961. Illus. pp. 394. $8.50. This symposium of 1959 was planned as a nationwide survey of plant and animal germ plasm to follow up the 1934-35 survey in the "Yearbook of Agriculture". Thirty-three authorities participated in the symposium. The papers are arranged under five headings: origin of germ plasm, need for the utilization of additional sources of germ plasm; developmental programs in crops and livestock; new approaches in the use of plant and animal germ plasm; and perpetuation and protection of breeding stocks. This outstanding book is highly recommended to all who are interested in plant and animal breeding.

FLOWERING PLANTS AND FERNS OF THE TEXAS COASTAL BEND COUNTIES, by F. B. Jones, C. M. Rowell, Jr., and M. C. Johnston. Rob and Bessie Wilder Wildlife Foundation. P. O. Box 1396, Sinton, Texas. 1961. pp. 165. $2.35. This is a list of the more than 1,300 species of higher plants that have been collected in the Coastal Bend Counties of Texas. The data is arranged by families, genera and species. This is followed by an alphabetical index. Recommended to all who are interested in the Texas flora.

PLANT MARVELS IN MINIATURE, by C. Postma. John Day Co., 210 Madison Av., New York 16, N. Y. 1961. Illus. pp. 173. $12.50. In this fascinating study the author presents by means of photographs and a simple explanatory text some of the wonderful beauty and complexity of the plant world. At the

[PLANT LIFE LIBRARY, continued on page 27.]

1. REGIONAL ACTIVITY AND EXHIBITIONS

OFFICIAL NEW ORLEANS AMARYLLIS SHOW 1961

MRS. JOHN KLEIN, JR. *Chairman*

The 13th Official Amaryllis Show at New Orleans with the theme "Rhythm Of The Seasons," sponsored by the Garden Circle affiliated with the American Amaryllis Society, The Federated Council of the New Orleans Garden Clubs and the Louisiana State Federation of Garden Clubs, was held March 25th and 26th, 1961 at Eleanor McMain School. Fifty Six Garden Clubs participated in the Artistic Arrangements and Corsage Divisions.

Mrs. John Klein, Jr. was Show Chairman, Vice Chairmen, Mrs. W. J. Perrin and Mrs. Lynn Messina, Honorary Chairman, Mrs. A. R. Oddo.

The arrangements were judged by six accredited judges and the horticulture entries were judged by nine Official Amaryllis Judges.

Mrs. G. R. Reynolds of Westgate Garden Club received the Silver Tray for the most outstanding arrangement titled "Natures Heirloom". Mrs. E. A. St. John of Metairie Garden Guild also received a Silver Tray, an Award of Distinction, titled "Twilight". Miss Dottie Dittman of Lil Mums Junior Garden Club won the Gold Cup in the Junior Arrangement Division titled "Easter Finery". Mrs. Ecuyer won the Blue Ribbon in the Formal Corsage Division for the second year, titled "On Fifth Avenue". Mrs. J. E. Vinci was awarded the Blue Ribbon for the Informal Corsage titled "Bon Voyage".

Mr. Norman Rusakof won the Ludwig Challenge Cup for the best Ludwig Specimen "Wyndham Hayward". He also won the Rueters Trophy for the most outstanding specimen of the Show "Wyndham Hayward". Mrs. W. R. Latapie was runner up with second best specimen "White Favorite". Mr. Milo C. Virgin won the Klein Award Silver Ice Bucket as sweepstake winner of the Dutch entries in the Show with 10 Blue Ribbons.

The Garden Circle won the Club Ribbon for the most Blue Ribbons. Mrs. Harry St. John won the Harry St. John Memorial Challenge Cup for the most outstanding registered American Hybrid "Harry St. John" (St. John, 1957). Mr. Milo C. Virgin won the Sweepstake Gold Trophy for the most Blue Ribbons in the American Horticulture. McDonogh No. 7 won the Trophy for the most Blue Ribbons in the School Division.

There were six Invitational Arrangements displayed on pedestals, by noncompetitive Guest Artists who were Mrs. W. E. Fourqueran "Palm Sunday". Mrs. Harry W. Brown, "My Rosary". Mrs. A. L. Herberger "Prayer For Peace." Mrs. Charles Hardie, "Ave Maria." Mrs. Clyde G. Welles "Easter Parade," Mrs. A. G. Viskel, "St. Francis And The Birds".

The following Amaryllis Society Awards were made, "White Favorite" 558 (Ludwig) exhibited by Mrs. W. R. Latapie, "Wyndham Hay-

ward'' 462 (Ludwig) exhibited by Mr. Norman Ruskof. ''General Eisenhower'' 657 (VanWaveren) exhibited by Mr. Milo C. Virgin. ''Nivalis'' 448 (Ludwig) exhibited by Mrs. A. J. Haydel. ''Apple Blossom'' 422 (Ludwig) exhibited by Mrs. C. A. Diebold Jr. and ''Cardinal'' 464 (Ludwig) exhibited by Mrs. W. J. Perrin.

The Preliminary Commendation (P. C.) awards were made. ''American Seedling'' Mrs. Rodney Baker. ''American Seedling'' Mr. Milo C. Virgin. ''Harry St. John'' registered 391 (St. John 1957) by Mrs. Harry St. John; and ''American Seedling'' by McDonogh No. 7 School.

There were 210 entries in Horticulture, and over 900 attended the show including a number of visitors from out of State such as Alabama, Mississippi, Texas and Oklahoma.

The 13th Official Amaryllis Show of New Orleans was displayed by Divisions 1 to 9 as per Revised Show Schedule for Official Amaryllis Shows in 1961 Amaryllis Year Book.

Mr. Milo C. Virgin was awarded a Special Trophy for the 2 Floret per scape displayed in a group of 3.

Miss Lynn Latapie and Miss Sharon Jacobs were registrars.

OFFICIAL HOUSTON AMARYLLIS SHOW 1961

Mrs. A. C. Pickard

The Houston Amaryllis Society's second official show was held April 16, 1961, at the River Oaks Forum of Civics, Houston, Texas. The members responded enthusiastically with several hundred specimens in fair condition even though the show date was postponed one week. Many of the nice specimens were spent and those grown in the garden suffered heavy wind and rain damage just as the blooms were showing color.

There is a great fund of experience among amateur competitors working toward some worthwhile achievement serving the purpose of informing the public in the manner of careful classification and standardized exhibitions. All the exhibits were classified in the respective 8 Divisions and judged by local official accredited Amaryllis judges. The floral treat was presented free to hundreds of visitors, many registered from other states.

After the show, visitors toured the Amaryllis gardens of some of the members. In one garden hundreds of named Dutch hybrids were growing and seedlings blooming, all developed by the member growers over a period of a few years.

Through the cooperation of local firms, Houston Judging Council, Holland hybridizers, and a member of the Houston Amaryllis Society, five silver trophies were awarded for outstanding entries. Also, the American Amaryllis Society's ''Award of Merit''. These trophies and trophy winning specimens were exhibited on a special table the ''Court of Honor''.

Competition was close for the highest score. The Silver Trophy has to be won two consecutive years or three times at intervals to be

kept permanently by the exhibitor. This beautiful trophy was awarded this time to Mrs. Sally Fox for the handsome Van Meeuween registered clone 'Zenith'. She also received the official American Amaryllis Award of Merit and a named clone of the Van Meeuween strain.

Mrs. Creel Brockman of West Columbia, Texas was awarded the Ludwig Challenge Cup, the American Amaryllis award of Merit, plus two bulbs of Ludwig strain under number for her potted specimen, 'Marie Goretti'.

Mrs. Jesse Haver won the Frank Lipper Trophy and the American Amaryllis Award of Merit for an unnamed American specimen.

Mrs. Chas. Pease won the Silver Trophy of the Houston Judging Council and the American Amaryllis Award of Merit for a miniature Amaryllis, Ludwig's 'Fire Fly'.

For the best entry for a Dutch seedling in the hybridizer class, Mrs. A. C. Pickard won the Becker Jewelry Co. Silver Trophy, also the preliminary commendation from the American Amaryllis Society.

Mrs. Marguerite Palmer received the Award of Merit in the invitational class for the clone 'Boquet'.

Other special awards were given to invitation exhibits (non competitive). Collections of a minimum of 5 were exhibited, including named clones and collections of seedlings with many new interesting colors from the rich dark black red, the delicately tinted pinks and salmons to the purest whites.

Mrs. Frank S. Bova and Mrs. W. D. Wells scored the winners in the collection classes.

The educational division included all stages of growth from seeds to the mature blooming clone as well as the different methods of vegetative propagation, cuttage, reaming and scoring the bulbs with potted results.

The Artistic division (the theme) "Parade of Amaryllis" featuring Amaryllis as the dominating flower was non-competitive, adding much beauty to the show. As an added attraction were poodle trees made of Amaryllis blooms with other foliage.

The show was spectacular with evidence that the Houston Amaryllis Society is achieving its objective—to promote and create a greater knowledge of growing Amaryllis.

OFFICIAL HATTIESBURG AMARYLLIS SHOW 1961

MRS. R. A. FOWLER, *President*
Hattiesburg Amaryllis Society

The Second Official Hattiesburg, Mississippi, Amaryllis Show under the sponsorship of the Hattiesburg Amaryllis Society and the American Amaryllis Society was held April 22-23, 1961 at the Community Center. "International Inspiration" was the theme of the show.

The nine sterling silver goblets were displayed on a circular organdy and lace-covered table in the center of the lounge. Above the

table and supported by an ivy-entwined wrought iron trellis was a revolving globe, symbol of the internationality of the show. The silver awards were won by the following:

Most blue ribbons—Mrs. Johnnie Jackson, Hattiesburg, Miss. Best potted Dutch Amaryllis—Mr. James Terry, Hattiesburg, Miss. Horticultural Sweepstakes—Mrs. Johnnie Jackson, Hattiesburg, Miss. Best potted American Amaryllis—Mrs. J. W. Snowden, Hattiesburg, Miss. Best Artistic Design—Mrs. J. O. Mayo, Hattiesburg, Miss. Best cut American Amaryllis—Mrs. Johnnie Jackson, Hattiesburg, Miss. Outstanding entry in Art Class—Mrs. R. L. Ford, Hattiesburg, Miss. Finest Cut specimen, Dutch—Mrs. J. C. Shivers, Poplarville, Miss. Best out of town potted Dutch—Capt. T. J. Pizani, New Orleans, La.

Robert D. Goedert, Amaryllis dealer of Jacksonville, Florida provided the door prizes which were outstanding Indian Hybrid Amaryllis bulbs.

Mr. W. D. Morton, Jr., New Orleans, La. Registrar and Secretary of Judges Council started proceeding for registering an outstanding seedling grown by Mr. James Terry, Hattiesburg, Miss. Name of the clone will be announced later.

The educational exhibit showed methods of propagating Amaryllis from seed and through cuttage. The display showed various stages of the development of bulbs produced by both methods as well as suitable containers, method of potting and soil.

The show attracted several hundred visitors from sixteen cities and six states.

A popular vote of those in attendance listed 'Apple Blossom' as the favorite variety.

OFFICIAL GREATER GULF AMARYLLIS SHOW 1961

W. C. Strain, *Chairman*

The Ninth Annual Greater Gulf Amaryllis Show presented by the Amaryllis Society of Mobile was held April 15 and 16, 1961 at Murphy High School, Mobile, Alabama.

W. C. Strain was Show Chairman and W. R. Lowe and H. E. McCarn were Co-Chairmen.

The Arrangements were judged by accredited Judges and the Horticulture entries were judged by official Amaryllis Judges. The show was attended by approximately 2,500 and was open to all amaryllis growers in the area.

The theme "Come, Stroll with the Amaryllis" was carried out by a statue of Venus as a focal point surrounded by dozens of beautiful amaryllis. There were nine divisions providing for entries in horticulture, arrangements, junior entries, hobby and art. The seedling division in which forty four entries were shown was of unusual interest.

A total of 337 entries were registered in the show.

Mrs. Gertrude Marshall was the winner of the most blue ribbons including Horticultural and artistic arrangements and was awarded a

Sterling Silver Paul Revere Bowl. Mrs. Marshall also won the trophy for the most blue ribbons in the horticultural division.

Mrs. W. P. Cazalas was awarded the trophy for the most blue ribbons in the artistic arrangement division and also the trophy for the most outstanding artistic arrangement of Amaryllis. The most outstanding horticultural potted bulb specimen of Dutch Amaryllis was won by W. C. Strain. Mrs. Hinton Davis was awarded the trophy for the most outstanding horticultural potted specimen of American Hybrid Amaryllis.

Ivan A. Owen won the award for the most outstanding horticultural cut specimen of Dutch amaryllis in the show. The most outstanding horticultural cut specimen of American hybrid Amaryllis was won by Joe Brummitt.

The Invitational trophy awarded for the Blue Ribbon Winner in the Invitational Class was won by Mrs. G. E. Moslander.

The best painting of Amaryllis in the adult division was won by Mrs. Vernica Lassiter and Leon Bridges won the Junior Art award for the best painting of amaryllis.

The Amaryllis Society of Mobile's Junior Trophy was won by Miss Darby Hickson.

OFFICIAL MEN'S AMARYLLIS SHOW, NEW ORLEANS 1961

Santo N. Cuchinotto, *Show Chairman*

The Second Official All-Horticulture Amaryllis Show presented by the Men's Amaryllis Club of New Orleans was held on Saturday and Sunday April 15th and 16th, 1961 at the Wm. C. C. Claiborne School.

Competition was open to the general public except for one class of single blooms restricted to members of the sponsoring club. The show was free and open to the public who viewed a fine array of blooms of many colors. This organization, which has set a goal of having everyone grow and admire amaryllis in their garden, received many compliments on a fine show.

Miss Marian A. Laine, Award of Merit winner in the Dutch hybrid class received the Steckler Seed Co. Award; Mrs. H. E. Dorr, Award of Merit winner in the American hybrid class received the Newsham-Beenel Nursery Award; Mr. T. A. Calamari, Jr., Sweepstakes winner received the Reuter Seed Co. Award for most blue ribbons in the Dutch class; Mr. Lewis Lloyd was the winner of the gold cup for the outstanding seedling; Mr. Toby Mullen was the winner of the most blue ribbons in the American hybrid class; Mr. Milo C. Virgin was the recipient of the President's Trophy, and the most blue ribbons won by a member of the Men's Amaryllis Club; Mr. Lewis Lloyd was the winner of the single bloom award. All of these winners received gold cups and ribbons which are permanent awards. The usual ribbons were awarded other winners that participated in the show.

American Amaryllis Society Awards of Merit were presented to Messrs. W. J. Perrin, Henry P. Fonteuberta, Marshall T. Maynard, John Klein, Jr., B. J. Banker, and Miss Marian A. Laine. Messrs. S. P. Gaspereczand and F. C. Hermann were awarded American Amaryllis Society Preliminary Commendation Awards.

The show was under the direction of Mr. Santo N. Cuchinotto, Show Chairman; Mr. J. Mahan, Co-Chairman; and Mr. H. P. Fonteuberta, Club President.

Fig. 2. 1961 Official Valdosta Amaryllis Show—(right) Dr. W. E. Wynens, Chairman of the Show; (left) Mr. Guy Rice, President, Men's Garden Club of Valdosta, Georgia.

OFFICIAL VALDOSTA AMARYLLIS SHOW 1961

GUY RICE, *President, Men's Garden Club of Valdosta, Georgia*

The Men's Garden Club of Valdosta staged their Fifth Amaryllis Show on April 22nd and 23rd 1961. This is the Third show staged

under the sponsorship of The American Amaryllis Society, and The Garden Club of Georgia. [Fig. 2].

Top awards were won in the Horticultural Division as follows: Mrs. B. J. Wetherington won the Award of Merit from THE AMERICAN AMARYLLIS SOCIETY for the best named clone 'Picotee'. This also won the Award of Merit from The Garden Club of Georgia.

Mrs. Willis Register won a Preliminary Commendation Certificate from THE AMERICAN AMARYLLIS SOCIETY, for the best entry, from The Hybridizer's Class, grown in a pot. Mr. Guy Rice won a Preliminary Commendation Certificate from THE AMERICAN AMARYLLIS SOCIETY, for the best cut scape in the Hybridizer's Class.

Mrs. Plowden won a Preliminary Commendation Certificate from THE AMERICAN AMARYLLIS SOCIETY, for the best Horticultural entry in the show, for an unnamed variety grown in a pot. Mrs. Richard Parrish won a Preliminary Commendation Certificate from THE AMERICAN AMARYLLIS SOCIETY, for the best unnamed variety on a cut scape.

Mrs. Van Bennett won the Tri-Color Award given by THE GARDEN CLUB OF GEORGIA for the best artistic entry in the show. Mr. Robert Goedert, of Jacksonville, Florida was given an Award of Appreciation for an outstanding Exhibit of species. Mr. Goedert included in this display a magnificent collection of the newest named varieties.

The increasing interest in growing amaryllis, in the Valdosta area was evident in the superb quality of the specimens exhibited in the show.

CORPUS CHRISTI AMARYLLIS SHOW 1961

MRS. CARL C. HENNY, *Secretary,*
Coastal Bend Amaryllis Society, Corpus Christi, Texas

The Coastal Bend Amaryllis Society again staged an Amaryllis Show in connection with the Lola Forrester Flower Show, April 15th and 16th, 1961.

A total of 118 cut Amaryllis scapes were entered by members of the Coastal Bend Amaryllis Society and other residents of Corpus Christi, Texas. All of these were garden grown—some of Dutch parentage, some of the Ludwig Dutch hybrids, and others of American hybrid parentage.

A total of 20 Ludwig Hybrid Amaryllis were entered as potted plants. One of these, 'Wyndham Hayward' entered by Mr. Charles W. Sanders, received the Corpus Christi Council of Garden Club "Award of Merit" for its excellence—having scored 95 points. This bulb produced two scapes of even length—each with 5 florets, and all blooming at the same time.

Mr. Leo Riley received the largest number of blue ribbons (5) for his entries and he received the Ludwig Challenge Cup. His entries were 'Nivalis', 'La Forest Morton', a Dutch Gracilis clone, and two American seedlings.

The Coastal Bend Amaryllis Society Show at the Lola Forrester Flower Show was an outstanding one, and of great interest to the general public.

ANNUAL REPORT—AMARYLLIS FORUM OF MOBILE (ALABAMA) 1960-61

ROBERT E. PARKER, JR.

The Amaryllis Forum of Mobile believes that a diversified program of study and activities is vital to develop a strong and informed membership. In the 1960-61 year—its third year of full activity—apart from the usual concerns of such an organization, the Forum, in fulfillment of this aim, has added some new features and strengthened others. The membership increase during the year of approximately twenty-five percent is evidence of the strength of the program.

The high point of the year was the first competitive amaryllis show sponsored by the Forum. It was based on the theme "Spring With Amaryllis". Held on April 22-23, 1961 at the Kate Shepherd Elementary School in Mobile, almost 250 entries were received in the competitive divisions.

A profusion of blooms was also furnished to decorate the stage and other public areas. There were a number of non-competitive hobby tables prepared by the members which dramatized to the spectators the extent of amaryllis culture, both in colors and sizes, in which a hobbyist can participate.

Classifications in the four divisions, with eight sections, included both Dutch and American amaryllis by names and colors, with separate divisions for each, including the cut and potted specimens.

Arrangements were also featured with a number of imaginative entries. A strong effort was made to stress the possibilities of making arrangements featuring amaryllis to further popularize them for this purpose since many persons minimize their use for arrangements.

All judging was by accredited judges and competition was open. The show chairmen were I. A. Owen and W. O. Cobb.

The best horticultural specimen was "Silver Lining" exhibited by Mrs. R. E. Chason. The most outstanding artistic arrangement was entered by Mrs. D. F. Ward. It was a dramatic arrangement entitled "On Mobile Bay" which used amaryllis and driftwood in harmony.

The membership pledge of the Amaryllis Forum includes, among other things, the statement ". . . that I will hold no secrets of culture, but will share what knowledge I possess with all members." In the spirit of this pledge, regular tours of members' gardens were initiated on Sunday afternoons throughout the spring and summer.

In an informal atmosphere, both the purposes of fellowship and study were accomplished. Acting on the premise that an amaryllis enthusiast likes nothing better than to talk about amaryllis, the tours give the members a full opportunity to discuss various procedures and practices "on the spot". The general exchange of ideas has benefitted all the members. They have also been able to give attention to other amaryllids and the use of all in landscaping.

Due to the very favorable growing conditions during this spring and summer in the Mobile area, members have been able to view the

propagation and growth of the plants under good conditions. Special study has been made of the effects and growth patterns produced by various feeding programs of the members—ranging from liquid to organic to commercial fertilizer. The effects of various insecticides and fungicides has also been observed first hand.

As will have been understood from the foregoing, the Forum did not recess during the summer months. The programs at the monthly meetings have been devoted to serious study sessions, including on one occasion the study of the generic order of plants, particularly as related to the Family Amaryllidaceae.

Other activities of the year included the placing of a display, which received special recognition, in the Federated Garden Clubs of Mobile County Spring Flower Show.

Special study projects were also undertaken by individual members on which a report will be given at a later date. Included in the tests and experiments are various procedures for forcing blooms, propagating by seeds, problems of bulb deterioration, etc. When some positive conclusions have been established, the Amaryllis Forum hopes to institute a program of the exchange of cultural information with other groups.

The retiring officers of the Amaryllis Forum for the 1960-61 year are J. W. Van Esler, President; W. O. Cobb, Vice-President; Mrs. Ellen Boe, Secretary; and Ennis Brown, Treasurer.

AMARYLLIS PARADE

MRS. A. C. PICKARD, *Houston, Texas*

Offiicial Amaryllis Judging Instructor

Plant Societies, like individuals, undergo constant change. Whether that change is for better or for worse depends on the attitude and action of the individuals that comprise the group.

While we are learning to grow more and better clones of Amaryllis, it is just as essential not only to our own happiness, but to the welfare of our Societies, that each member make a special effort to overcome any tendency toward intolerance. Membership in any organization involves duties as well as privileges. "That's Democracy!" Kindness is an indispensable ingredient here. If we strive to be understanding and rise above resentments, an important step will have been taken toward a goal not only for ourselves, but for the welfare of the organization. We are affiliated with a National Society whose objectives deserve our interest and support to attain greater excellence.

WHY FLOWER SHOWS?

The purpose of any flower show is, in general, to promote interest in the art of gardening. On a more personal basis, flower shows are an incentive to the serious-minded gardener to produce and exhibit flowers better than those grown by his neighbor members.

The primary purpose of such friendly rivalry is to stimulate interest in beautiful flowers, well planned gardens, exchange information on new varieties and methods of culture.

The first rule when competing for high scores in a show is to make sure that the entry meets all the requirements outlined in the schedule.

The schedule committee is the most important, for the schedule can make or break a show. Planning a schedule requires considerable thought and study. Explanation of terms used in the schedule are necessary for proper interpretation. Suggestions to exhibitors might include methods of preparing the entries on the show date that will aid considerably in easing that dreaded rush hour. It is necessary that show rules be set to conform with the revised show schedule for official Amaryllis shows that has been officially adopted by the American Amaryllis Society.

The official schedule has not only improved the categories of classification, but has established a sensible and effective table of awards of merit to be given only for registered Amaryllis clones.

Few blue ribbons and awards are won in official Amaryllis shows by those exhibitors who look their plants over the day before the show and decide they might as well enter cut scapes by the dozen, and looking the garden over, taking lightly the appearance of the flower rush to pot up a few bulbs.

Really successful exhibiting demands early preparation, and the response to bloom is usually not as uniform as anticipated. By good selection, careful handling, and following a systematic procedure, one can make exhibiting the fun and thrill it should be. By so doing, one will have acquired a greater appreciation of what it takes to make specimen blooms score high.

But, after you have done your best to win the highest score, and lose—above all, be a good sport as all gardeners should be. If you console yourself in the conclusion that the winning specimen had to be exceptionally good to beat yours, try a little bit harder to win the next time. Make competition fun! Don't take the joy out of the show. Be fussy about the small points in your exhibits, and each succeeding show will bring you blue ribbons that get bluer and trophies that grow in number.

TO REGISTER OR NOT TO REGISTER CLONAL NAMES?

One of the chief purposes of specialized plant societies is to prevent confusion and errors in clonal names and to keep hybrids true to name. Awards to registered named clones are given to stimulate competition, thus encouraging continued improvement in standards of judging.

To encourage breeders, preliminary commendations may be awarded to seedlings. Once a seeding has proved worthy of recognition, the next step is registration.

An Amaryllis clone worth growing is worth knowing. A name identifies a plant as it does a person—a good clone deserves a good name.

Not all clones registered are introduced, for many are kept in the garden for the personal gratification of the gardener.

The American Amaryllis Society sponsors registration. The information is available from the Registrar.

WHY HAVE JUDGING SCHOOLS?

Schools are the best way to bring to all members the same knowledge in a condensed form. Not solely to train Judges, but to teach how to improve their flower shows by better staging, better exhibiting, better growing methods. All these factors are involved. Also, some of the human qualities in being a good Judge and a better exhibitor.

Judging is not just a business of awarding ribbons. Behind the awards there should be a well rounded knowledge of species, varieties, forms, types, and above all, the attributes of quality and perfection.

The best preparation for judging is growing the material. You will know their characteristics and by the same token appreciate perfection.

The writer does not set herself up as a supreme authority. She has undertaken her task as an Amaryllis Instructor in Judging with genuine humility and has much to learn, having enjoyed a wide experience in the study of growing and Judging Amaryllis for many years. Especially pleased will she be if the efforts put forth will guide and lead Amaryllis Judges into habits of thought and procedure which will result in greater satisfaction to them, to exhibitors and the general public.

JUDGES COUNCIL

When Judges began working in shows, they soon found problems and lack of knowledge and uniformity in Judging Amaryllis. All Judges will realize that they are in need of constant study and review to increase and improve their knowledge and experience of the American Amaryllis Society rules and scoring procedure.

The primary purpose of organizing the Amaryllis Judges Council was a form a unit for advanced study, practice Judging, and point scoring. By discussion in these fields, Judges find meeting often, a convenient help in solving problems which arise from poor show practice, and achieve greater uniformity in the standards, with more understanding and friendliness—and less criticism—between Judges. So, we summarize briefly better ethics between Judges:

> "A chain is only as strong as its weakest link" and every Amaryllis Judge should endeavor to be a strong link in the Society.

AMARYLLIS JUDGES CERTIFICATES

Since the last report in the 1961 Amaryllis Year Book (page 31), the following named Amaryllis Judge's Certificates have been issued by the American Amaryllis Society.

5a. (Reissued after a refresher course) Mrs. Wilday Tudury, 155 Homestead Ave., Metairie, La.
7a. (Reissued after a refresher course) Mrs. E. F. Lehmann, 2201 Paris Road, Chalmette, La.
95. Mrs. Jesse Haver, 113 Christianson, Houston 3, Tex. (horticulture only)
96. Mrs. Geo. S. Taylor, Box 62, League City, Texas. (Horticulture only)
97 Mrs. Richard Anderson, 2012 Melody Drive, La Marque, Tex.
98. Mrs. John Klein, Jr., 2504 Mistletoe St., New Orleans 18, La.
99. Mrs. G. J. Durbin, 6303 General Meyer St., New Orleans 14, La.
100. Mrs. R. J. Huxen, 553 Crystal St., New Orleans 24, La.
101. Mr. C. J. Crochet, Route 1, Box 18, Prairieville, La.
102. Mrs. C. J. Crochet, Route 1, Box 18, Prairieville, La.

For information on The National Judges Council see page 163.

[AMARYLLIS ROUND ROBIN NOTES, Mrs. Fred Flick, continued from page 154]

Corpus Cristi plants her seed in beds that were made over an old shell driveway, and has bloom in 18 months.

Mrs. Dusek,—Soil mix: one part compost; one part good garden loam; one part sharp sand. To each bushel, add one four inch pot of a balanced fertilizer.

Bernice Curfman, Ga.—Soil mix: I use a sandy soil with some vermiculite mixed in, then add a teaspoonful of bone meal and one of sheep manure mixed in the bottom of the pot.

Mrs. Bush, N. J.—Soil mix: Sandy loam mixed with peat moss, and I add some bone meal and dried manure.

Ella McCullock, Ontario, Canada,—Soil mix: Woods soil; sand; garden loam; bone meal; dried cow manure; and a teaspoonful of muriate of potash in each pot.

Len Woelfle, Ohio. [Mr. Woelfle is hybridizing *Hymenocallis* and writes of one of his crosses.]—"Pax is a cross of *H. amancaes* x *H. narcissiflora*; and it has a very good obconical cup, with flaring lobes, opens from yellow buds to creamy white, then fades to almost white with yellow shadings. It is easy and durable for me, and reports are that it makes a tremendous bulb and plant. In mid summer, from a spring set large bulb, it will grow to about 36 inches tall with wide 3 to 3½ inch leaves. It carries up to eight blooms on a scape."

Madge Tebben, Illinois.—"I have placed the most of my amaryllis outside where they receive filtered sunshine. Part have been placed on the south side where they get more sun. Will see which give more blooms during the winter. Before putting the bulbs outside, I was giving weekly feedings of muriate of potash, and superphosphate alternately."

[PLANT LIFE LIBRARY, continued from page 14.]

beginning of each chapter there is a slightly enlarged photograph of the various parts of the plant in their familiar form, and additional photographs then show increasing magnification until, at 2000 to 3300 times, complex and beautiful structures are revealed. The plates are grouped under (1) structure of the plant; (2) grasses; (3) flower; (4) spread of the seed; (5) leaf; (6) hairs on the plant; (7) the stalk; (8) wood; (9) roots; and (10) parasites. This book is so outstanding that it is highly recommended to the layman gardener and the scientist alike.

READINGS IN THE HISTORY OF AMERICAN AGRICULTURE, edited by W. D. Rasmussen. Univ. of Illinois Press, Urbana. 1960. Illus. pp. 351. $6.50. The fascinating course of American Agriculture is traced in this illustrated volume of fifty-two selections highlighting the important landmarks in American agricultural history. The material is arranged under the headings—beginnings of American agriculture, 1607-1775; agriculture during the confederation, 1776-1789; gradual improvements in American agriculture, 1789-1861; the first American agricultural revolution, 1861-1914; World War I stimulates demand for farm products, 1914-1919; return to normalcy and agricultural depression, 1920-1932; the New Deal, 1933-1939; and World War II and the second agricultural revolution. This outstanding book is highly recommended to the student and also to all who are interested in the history of our country.

PLANT PATENTS, 1960 SUPPL., publ. by American Association of Nurserymen, 635 Southern Bldg., Washington 5, D. C. pp. 6. This supplement includes patents 1893 through 2007. These are listed under patent number; date granted; common name; originator or discoverer; and assigned to. For easy reference the patents are then listed alphabetically under common names; and also the names and addresses of originators or discoverers and assignees. Highly recommended to all interested in plant patents.

THE NEW PERENNIALS PREFERRED, by Helen Van Pelt Wilson. M. Barrows & Co., 425 Park Av., So., New York 16, N. Y. 1961. Illus. pp. 320. $4.95. This revised edition of the author's "Perennials for Every Garden" incorporates new advances. In addition to the enlarged treatment of the subjects treated in previous editions, there are three new chapters—on shade gardening; on ferns; and on gardening for the "near view" by doorsteps and in door yards.

THE BEGINNING GARDENER, by Katherine N. Cutler, M. Barrows & Co., 425 Park Av., So., New York 16, N. Y. 1961. Illus. pp. 173. $2.95. This new book was written for all beginning gardeners—young and old. It provides information on choosing the right spot and gives the "hows" and "whens" of planting; and also a list of vegetables and flowers.

THE FLOWER ARRANGEMENT CALENDAR, 1962, by Helen Van Pelt Wilson. M. Barrows & Co., 425 Park Av., So., New York 16, N. Y. 1961. $1.50. The publishers sponsor an annual flower arrangement calendar contest. In this little book some of the outstanding photographs of floral arrangements accepted by the publishers are reproduced in calendar form for 1962. This calendar will be useful to those interested in flower arranging.

MARK CATESBY, THE COLONIAL AUDUBON, by G. F. Frick and R. P. Stearns. Univ. of Illinois Press, Urbana. 1961. Illus. pp. 137. $5.00. The objective of this attractive book is to set forth from the original sources a biography of Mark Catesby (1683—1749); to evaluate his work as a naturalist, and to estimate his stature in the history of science. In Part I, a biography of Catesby is presented; and in Part II, Catesby's work as a naturalist is detailed. He was a pioneer in the field of scientific illustration; in botany, zoology, ichthyology, and especially ornithology, he explored new and untried fields, and for more than a century, his work—"The Natural History of Carolina, Florida and the Bahama Islands (1731—43 [1729—47])"—was the best single treatment of the flora and fauna of North America. This important book on Mark Catesby fills a long felt need and is highly recommended to all biologists, and all others who are interested in the history of our Country.

[PLANT LIFE LIBRARY, continued on page 54.]

Fig. 3. *Amaryllis* x *johnsonii* as grown by Douglas D. Craft, Chicago, Illinois. A, complete umbel in bloom; B, longi-section of flower, about 8/10 natural size; C, longi-section of ovary, showing inside of locules; ovules abortive (from a flower almost dried up). Drawings by Douglas D. Craft.

2. SPECIOLOGY

[EVOLUTION, DESCRIPTION, CLASSIFICATION AND PHYLOGENY]

AMARYLLIS x JOHNSONII

DOUGLAS D. CRAFT

The writer remembers *Amaryllis* x *johnsonii* when as a young high school student he had seen tubs of this beautiful "Johnson Lily" brought to a neighbor's doorstep from dormancy over the winter in her farm cellar. Both or rather each of these tubs must have contained 15 to 20 bulbs per tub and they were indeed a beautiful sight to behold when in bloom. Remembering this from his adolescent boyhood, the writer sent a letter to the kind lady in the foothills of the Catskills. Though she had long since moved, she still treasured her "Johnson Lilies" and sent the author three blooming sized bulbs.

These bulbs were then potted up over their necks in a heavy, rich, garden loam as per the lady's specifications. Last year they bloomed mid-summer in the yard. After being kept dormant in the cellar this year, they were brought to light in a south window in late February. Immediately, buds began to show, two per bulb and the pot was a blaze of color about the first week in April [Fig. 3]. Leaves as well as three or four offsets appeared with the blooms.

Observations: This early hybrid likes heavy soil and seems to be a deciduous clone. In fact it grows much more heartily when it has had a long rest over winter. Flower stalks however appear to be somewhat weak and often must be staked. This may be partially due to its rapid growth cycle. Leaves are long and narrow and reach at least two feet in length. Flower scapes are also long and florets are small, very trumpet shaped as in some of the species. Margins of the flowers are serreated and waved giving them added distinction. This beauty is recommended for all ardent species lovers.

A NEW BOLIVIAN AMARYLLIS

MARTIN CARDENAS, *Bolivia*

This new *Amaryllis* species is characterized by its small flowers with a very short tepaltube and its small seeds. It crosses with species of the subgenus Amaryllis. The size of the flowers are reminiscent of *Amaryllis blumenavia* of the subgenus Sealyana which however has petiolate leaves. It grows on sandy slopes among rocks in a dry (xerophytic) environment.

Amaryllis mollevillquensis Cardenas, **sp. nov.**

Geophyta 30—60 cm. alta. Radicibus paucis 8—10 cm. long. Bulbo ovoidea 4—7 cm. long., 3—7 cm. crasso, albo tunica exteriore brunea. Foliis in anthesi 3—5, loratus 20—40 cm. long., 2—3 cm. latis apice parce acutis, basim attenuatis. Scapo 30—60 cm. long., 5—20 mm. crasso, superne attenuato. Umbella 2—6-flora. Bracteis spathaceis 3—5 mm. long., 4—7 mm. latis, diluto bruneis. Pedicellis 1.5—3 cm. long., viridibus suprene bruneis, inferne albidibus. Ovario paulo trigono 8—10 mm. long.,

Fig. 4. *Amaryllis mollevillquensis* Cardenas, *sp. nov.* Reproduction of a photo of the holotype specimen.

4—5 mm. crasso viride nitente. Tubo tepalorum 3—4 mm. long. viridiscente. Paraperigonio brevissimo albo hyalino. Setepalsegmentis lanceolatis 6 cm. long., superne 15 mm. latis, lateralia 13 mm. lata. Petepalsegmentis lanceolatis, superne 5.2 cm. long., 12 mm. late, inferne 8 mm. late. Omnibus segmentis rubi aurantiacus a basim viridiscentibus, interiora albo carinatis. Staminibus tubo adnatis 2.5—3 cm. long, superne curvatis. Filamenta superne rubi salmonea, inferne alba. Stylo 4—5 cm. long., inferne albo, superne rubi salmoneo. Stigma triloba vel paulo trifida. Capsula trilocularis 2—2.5 cm. diam., fusco albescentis. Semina atro brunea vel nigra, minuta, 10 mm. long. Patria: Bolivia, Provinsia Bilbao, Departamento Potosi, prope Mollevillque, 2,700—2,800 m. [Fig. 4]

Geophytic plants, 30—60 cm. tall. Roots few, 8—10 cm. long. *Bulb* ovoid 4—7 cm. long, 3—7 cm. in diam., covered by a gray-brown tunic. *Leaves* at anthesis 3—5, lorate, 20—40 cm. long, 1.5—3 cm. wide, tapering and attenuate at the base. *Scape* 30—60 cm. long, tapering upwards, 5—20 mm. in diam., dark green, purplish at the base. *Spathe* 3—5 cm. long, 4—7 mm. wide, light brown. *Umbel* 2—6-flowered. Pedicels 1.5—3 cm. long, 1.5—2.5 mm. in diam., green-whitish below, brown above. *Ovary* slightly trigonous, 8—10 mm. long, 4—5 mm. in diam., green, shining. *Tepaltube* only 3—4 mm. long, red-greenish. *Setepalsegs* lanceolate, 6 cm. long, upper one 15 mm. wide at the middle, laterals 13 mm. wide. *Petepalsegs* lanceolate, upper two 5.2 cm. long, 12 mm. wide, bottom one only 8 mm. wide. *Paraperigone* 1 mm. long, white hyaline. All of the tepalsegs orange red, greenish at the base, with a white stripe in center inside. *Stamens* adnate to the petepalsegs for the length of the tepaltube, three shorter, 2.5 cm. long, three longer 3 cm. long, all curved. *Filaments* white below, salmon red above, anthers 3 mm. long, pollen yellow. *Style* straight, 4—5 cm. long, white below, salmon red above. *Stigma* trilobed to shortly trifid, red-lilac. *Capsule* 2—2.5 cm. in diam., very light green to whitish when opening. *Seeds* rather small, dark brown to black, 10 mm. long. [Fig. 4].

Bolivia: Province Bilbao, Department Potosi, near Mollevillque, 2,700—2,800 m. M. Cardenas, February 1954, No. 5145 (holotype), in Herbarium Cardenasianum. (Cotypes in US, LIL and Cochabamba University Herbarium).

DARLING RIVER LILY, CRINUM FLACCIDUM

WILLIAM MORRIS, *Australia*

Crinum flaccidum is one of the smallest species of the genus. It is fairly widespread in Austrailia having been recorded from Queensland, New South Wales, Victoria, South Australia, and Northern Territory. It is predominantly a plant of the inland waterways and is commonly known as the Darling River Lily. It has a bulb about the size of the Cape Belladonna, *Brunsvigia rosea*, and this bulb is not elongated into a neck as are so many other crinums. If the bulb is growing deeply in the soil, it develops a narrow deciduous pseudo-neck, but this is absent if the bulb is growing shallowly or just at the surface.

The flowers are described as white but some of those that I have seen are tinged pink which very occasionally is deep enough on the back of

the tepalsegs to give a slight pinkish cast to the flower. The blooms are extremely variable in shape from small, narrow to larger broad tepalsegs. [Fig. 5] The small tepalsegs are about 2" x 1/4" (giving a very narrow-seged flower) to 3" x 1 1/4" (giving a full, cup-shaped flower). The larger fuller flowers are very lovely and well worth cultivating.

I have only seen this species in two localities. The first was in the Pilliga scrub, a rather large area of very sandy soil covered usually with *Callistris*, Cypress Pines, between Narrakriand and Coonabarabran in northwestern New South Wales. Here in the sand the bulbs are situated 10" to 15" deep. They have a long pseudo-neck and usually

Fig. 5. *Crinum flaccidum* in its native habitat in Australia, showing a specimen with broad tepalsegs. Photo by William Morris.

a poor development of the leaves. When I saw them in January (the beginning of the flowering season), the leaves were only about 6"—10" long and about 1/2"—5/8" wide. This area is subject to heavy frosts and is at an elevation of 800—1,000 ft. The winters are quite cold. In this area very few bulbs were large enough to flower, and only one flower scape was noted. However, many more might appear after a rain. The bulbs were scattered sometimes a dozen or two in clumps but more often only 2—6 together.

The other locality was along a creek about six miles from Quirindi. This town is the first town across the Dividing Range after leaving the coastal area from the Hunter River valley. The creek drains from the divide which is only about 300 ft. higher than Quirindi (1280 ft.) at this spot, and flows westward. The bulbs are found within a mile or two of its headwaters. In places they are in great numbers as shown in Fig. 6. The photo shows only perhaps a quarter of the scapes which had been in flower since the others were heavy with seeds and had fallen over. Here the bulbs are about 4 to 6 inches below the surface in a heavy black soil which is extremely hard to dig. Farther down the creek, they were also very common in the silt on the flood terraces and here they often are just below the surface. The leaves again are not very large, about 12"—15" long, and 1/2"—3/4" wide. These leaves tend to grow up

only about 6 inches before twisting and curling towards the ground. As the flower scapes are two to three feet tall, this from a distance gives an effect similar to that of the Cape Belladonna, *Brunsvigia rosea*—they appear to be flowering without leaves. Whether the leaves will grow longer during the late summer and autumn after the rains, I do not know, but in pots here (on the coast at sea level), I have some leaves three feet long and over one inch wide.

Fig. 6. *Crinum flaccidum,* showing great numbers growing naturally in its native habitat. Photo by William Morris.

Both of the above localities have January and February daily shade temperatures of around 100° F. In fact on both days on which I was out digging up bulbs, the shade temperature was above 105° F, and I do not care to guess the temperature in the sun. So this *Crinum* species is used to high summer temperatures and much lower than usual winter temperatures.

BOOPHONE DISTICHA

GRANT V. WALLACE, *Berkeley, California*

In the Ainsley collection, referred to in my articles on *Nerine* and *Brunsvigia josephinae*, there also appeared two very long-necked, slender bulbs, with striate, light brown coatings. I was delighted to note that the two-ranked, wavy foliage, suggestive of a bamboo rake, was that of *Boophone disticha,* known for its use as arrow poison by the South

African natives and its maddening effect on cattle, as well as for being a very infrequent bloomer. It is said to be "triggered" by veldt fires, which implies that it needs a good baking in order to produce buds.

I wasn't able to simulate a prairie fire; but in August, 1946, one bulb produced a scape. This is short and very stout, bearing a compact umbel, six inches across, composed of a hundred or more *Nerine*-like flowers, three-quarters of an inch in diameter. These open from the outside of the umbel inward; the new ones are old rose, deepening to raspberry-red with age. The white anthers protrude, and the fragrance is very fine. The effect when in full bloom is that of a deep-rose pin-

Fig. 7. *Boophone disticha*, as grown by Grant V. Wallace at Berkeley, Calif. Photo by L. S. Hannibal.

cushion. After blooming, the pedicels are produced to three times their normal length, thus extending the seed capsules for better distribution. My plant was visited freely by bees but set no seed. In 1948, both bulbs died, possibly from a fungus attack.

When the *Boophone* was in bloom, and later, when it was in the "seed" stage, Mr. Lester S. Hannibal photographed it [Fig. 7]. These pictures may be seen in his paper, entitled "Boophone and Brunsvigia," in the January, 1947, issue of *The National Horticultural Magazine*.

WORSLEYA RAYNERI, THE BLUE AMARYLLIS

Mr. Wallace Stevens of Wanganui, New Zealand furnished the photo of *Worsleyi rayneri* reproduced in Fig 8. It flowered in New Zealand for the first time in January of 1961. The original bulb was

Fig. 8. *Worsleya rayneri,* The Blue Amaryllis, as grown by Wallace Stevens, New Zealand.

given to him by the late Major Albert Pam, who distributed samples to a number of friends in the hope that his particularly selected strain could be preserved. *W. rayneri* comes from the Organ mountains in Brazil.

Fig. 9. *Brunsvigia josephinae* (Red.) Ker-Gawl., as grown by Grant V. Wallace, Berkeley, Calif.—(bottom) elongating scapes, 9-4-50, one to right soon overtook the other; (middle), 9-17-50, well advanced, both scapes about same height; (top) 9-30-50, in full bloom. Photos by Grant V. Wallace.

BRUNSVIGIA JOSEPHINAE—A GIANT AMONG AMARYLLIDS

GRANT V. WALLACE, *Berkeley, California*

An enthusiast who collects any rarity—whether it be birds' eggs, buttons, beetles, or *bulbs*—will be sure to form many fine friendships with those of similar tastes. In the present case, this principle was exemplified in a manner that, while it was conducive to sadness at the time, resulted in the successful rearing of a bulb species never before tried in this area.

Since the 1920's, I had been growing a variety of South African bulb material, principally from seeds purchased in that region. About 1931, a friend handed me a catalogue of rare bulbs, bearing the name of Gordon Ainsley, Campbell, California. A visit to his nursery followed shortly. He turned out to be a true *aficionado*, who was actually more interested in collecting bulbs than in selling them. Not only was this the case, but he generously contributed many fine things to my collection, asking in return only a report on results.

Our friendship, with its common interest, endured for more than ten years. Then, in the fall of 1942, Mr. Ainsley passed away. It became my privilege to assist Mrs. Ainsley in disposing of the *Nerine* section of the collection, consisting of several hundred bulbs of all sizes. Most of them were sold to a dealer in southern California; I was permitted to keep a number of interesting-looking specimens for trial. This assortment consisted mostly of *Nerine sarniensis* types (the Guernsey lily of London flower marts); but two unfamiliar bulbs, with shapes and coatings unlike those of *Nerine*, eventually provided the material for this account. (All the material had been grown from seeds, presumably obtained from Cape dealers. No record could be found, but Gordon had once shown me a flatful of *Brunsvigia* seedlings. Apparently, some of them had been mixed in with the *Nerine* seedlings.)

In November, 1942, the two little strangers were planted on the west side of our house in Berkeley, in a frostless strip where a large number of Barr hybrid *Nerines* were thriving. Their leaves turned out to be gray-green and strap-shaped, not unlike those of a typical *Nerine*, at that stage of progress. During the first four winters, only leaves were produced. These became progressively longer and wider as the years passed, finally becoming three or four inches wide and about 18 inches long and tongue-shaped; fairly upright, with the upper third arching. The bulbs, which had been about an inch and a half in diameter when planted, now were reaching a very large size, made evident by shallow excavation around their tops.

The "great day" arrived on September 5, 1946, when a spathe tip appeared from the center of the crown of one of the bulbs. Here follow my notes, as they were set down at the time:

"September 15, 1946. It is just going to open its buds. Tremendous scape, like a little tree trunk."

"September 23, 1946. First flower opened. Red, with chartreuse

throat, and chartreuse on outside, half way up from base. Not widely opened; tight funnelform; not conspicuous. Scape and pedicels outweigh flowers, 'century-plant' style. Scape, 20″ tall and 1¼″ thick; pedicels, 12-14″; umbel, 24″ diameter; flowers, about 25. It *is* a *Brunsvigia*, but species is in doubt."

The following year, these notes appear:

"August 24, 1947. *Brunsvigia* (same bulb that bloomed before) showed a bud, twelve days earlier than last year."

"September 17, 1947. *Brunsvigia* fully opened. Flowers, about 30; scape, 22″; pedicels, 12-14″; diameter of umbel, 30″."

Some interesting data were recorded in 1948:

"September 10, 1948. *Brunsvigia* (the same bulb as before) showed its bud; the other bulb has not bloomed as yet. Infloresecnce gets larger each year."

"October 11, 1948. Full bloom. Scape, 24″; diameter of umbel, 30″; flowers, 41; over-all height, 36″; pedicels, 12-14″. The scape averaged one and three-quarters inch of growth each twenty-four hours while it was developing, depending on temperature and moisture—some days, more; others, less."

On July 17, 1949, both bulbs were transplanted to a raised bed in an exposed area, away from the house. Their winter-hardiness was in question, but the leaves proved to be as frost-resistant as those of the closely related "belladonna" *(Brunsvigia rosea)*. Both bulbs were the size of a coconut; only one had bloomed so far. The record:

"September 4, 1949. The usual *Brunsvigia* is budding, just ready to open. The other one shows no bud."

"September 20, 1949. Full bloom; approximately 50 flowers (nine more than last year, and the most ever produced). Not so tall or broad as last year; it had just been moved; not yet established."

Finally, in 1950, the other bulb decided to bloom, in the unpredictable fashion of most amaryllids:

"October 1, 1950. Both Brunsvigias in bloom; very effective. Both are full size and identical. One has bloomed regularly for four years; the other, for the first time this year. *(Why?)* Took progressive pictures of scape development. [See Fig. 9.] As two plants were blooming together, the abundant bee-visitors caused them to set viable seed about a month later."

The history from that time to the present (January, 1961) is here presented in condensed form:

1941. Both bulbs bloomed well.
1952. One bloomed weakly; the other, not at all.
1953. Only one bloomed.
1954. No flowers. One bulb died, either from infestation by the narcissus-bulb fly or from a fungus infection; it was completely gutted and full of psocids (booklice).
1955. The survivor bloomed, and had a strong offset.
1956, 1957. Bloomed both seasons.
1958, 1959, 1960. No flowers, but bulb and its offset made a thrifty growth of leaves.

The blooming period fluctuates slightly, between September and October—a little later than *B. rosea.* The growth cycle and cultural requirements are the same as those of the latter.

In the size of bulb and leaves [Fig. 10], this species is surpassed by no other members of the Amaryllidaceae except certain tropical *Crinums.* On the other hand, the individual flowers are almost ridiculously small.

Fig. 10. *Brunsvigia josephinae,* as grown by Grant V. Wallace, Berkeley, Calif.—two specimens in full leaf, Jan. 1, 1951. Photos by Grant V. Wallace.

The scape has an interesting provision to insure the dispersal of seeds. Although the stalk, while active, is extremely thick and fleshy, it dries out completely at the same time the seeds ripen, becoming like straw, and practically weightless. Simultaneously, a point of severance develops at the neck of the bulb, and the scape breaks away cleanly. The dry seed-heads are propelled by the wind across the South African veldt, exactly like our own "tumbleweeds."

I unfortunately failed to grow a supply of seedlings in the productive years, thinking the plant was ironclad and deathless. It is hoped

that seeds will be produced in the fall of 1961 if it decides to bloom again.

After inspecting various photographs of flowers and foliage, Dr. Hamilton P. Traub has definitely determined the plant here discussed to be *Brunsvigia josephinae* (Redouté) Ker-Gawl.

The picture of the plant in bloom was also used in the *Journal of the California Horticultural Society*, Volume X, Number 2, April, 1949, together with notes on this and other amaryllids. In that account, I erroneously referred to it as "*Brunsvigia gigantea.*"

BRUNSVIGIA ORIENTALIS FORMA COOPERI

J. P. van der Walt, *Republic of South Africa*

The interesting photograph—reproduced in Fig. 11—was taken near Hermanus, Cape Province, which is about 55 miles south-east of Cape Town and represents one of the most arid coastal areas in all of South Africa. The unique features of this Brunsvigia form are the few flowers, a short scape some eight inches in length, and the brick-red

Fig. 11. *Brunsvigia orientalis* forma *cooperi,* in its native habitat in South Africa. Photo by J. F. van der Walt.

coloring of the pedicels and flowers which practically match each other. The scape in turn is colored a dark red-brown. The plant is obviously a form of *Brunsvigia orientalis* (L.) Ait. ex Ecklon. Practically all features are in agreement with Bakers description of *B. cooperi,* which is considered a synonym of *B. orientalis.*

REGISTRATION OF NEW AMARYLLID CLONES

Registrar: Mr. W. D. Morton, Jr.

This department has been included since 1934 to provide a place for the registration of names of cultivated *Amaryllis* and other amaryllids. The procedure is in harmony with the INTERNATIONAL CODE OF BOTANICAL NOMENCLATURE (edition publ. 1956) and the INTERNATIONAL CODE OF NOMENCLATURE FOR CULTIVATED PLANTS (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "DESCRIPTIVE CATALOG OF HEMOROCALLIS CLONES, 1893-1948" by Norton Stuntz and Ballard was published in 1949. This may be obtained at $2.50 prepaid from: Dr. Thos. W. Whitaker, Executive Secy., THE AMERICAN PLANT LIFE SOCIETY, Box 150, La Jolla, Calif. CATALOG of HYBRID NERINE CLONES, 1882-1958, by Emma D. Menninger; and CATALOG OF BRUNSVIGIA CULTIVARIS, 1837-1959, by Hamilton P. Traub and L. S. Hannibal were published in 1960 Plant Life, with additions to both in Plant Life 1961. In Plant Life 1961, the first edition of THE GENUS X CRINODONNA was published which serves also as a catalog of cultivars. A catalog of Amaryllis names, and also catalogs of the names of other cultivated amaryllids, are scheduled for publication in future issues.

Only registered clones of Amaryllis and other amaryllids are eligible for awards and honors of the AMERICAN AMARYLLIS SOCIETY. Numbers of registered clones are preceded by a prefix, an abbreviation for the genus concerned. Thus A-390, the "A" standing for *Amaryllis*; Z-1, the "Z" standing for ZEPHYRANTHES, etc.

Correspondence regarding registration of all amaryllis such as *Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis*, and so on, should be addressed to Mr. W. D. Morton, Jr., Registrar, 3114 State Street Drive, New Orleans 25, Louisiana. The registration fee is $2.00 for each clone to be registered. Make checks payable to AMERICAN PLANT LIFE SOCIETY.

HYBRID AMARYLLIS CLONES

Registered by Ludwig & Co. Hillegom, Holland:

Amaryllis clone **'Peppermint'**; reg. #A-669, May 25, 1961 (First distributed in 1960). D-5a (Leopoldii); scape 26-20" tall; spring (late) flowering; umbel 4—5-flowered, sometimes up to 6-flowered; flower length (depth) 3"; 8"-9" in diameter; the five upper segs are pure white, streaked cardinal red (HCC-822/3) along the main rib, the lowermost seg is pure white; throat greenish white. Outstanding for the striking color combination.

Amaryllis clone **'Royal Dutch'**; reg. #A-670, 1961 (first distributed in 1960). D-5a (Leopoldii); scape 22"-24" tall; spring (half late) flowering; umbel 4-fl'd; flower length (depth) 3"; 7"-8" in diam.; the end of the segs is orient red (HCC-818/1), changing to very light scarlet (19/1, 19/2 and 19/3) inward, and to pure white and slightly greenish in the throat; stamens and style pure white.

Amaryllis clone **'Sight Show'**; reg. #A-671, May 25, 1961 (first distributed in 1960). D-5a (Leopoldii); scape 26" tall; spring (half late) flowering; umbel

4-fld; flower length (depth) 3″; 8″-9″ in diam.; the brilliant color ranges from porcelain rose to carmine rose, slightly lighter toward the apexes of the segs, and darker in the throat; stamens and style are rose colored.

Registered by Ralph H. Becker, 1823 Treasure St., New Orleans, La.:

Amaryllis clone **'Winner'**; reg. #A-667, Dec. 30, 1960. Flower length (depth), 3 3/4″, Leopoldii (D-5a); scape 20″ tall; spring flowering, leaves present at flowering; umbel 4-fld.; flowers 7″ in diam.; color orient pink (HCC-819) with greenish stripe in center of segs; two upper opposite segs shading to 822 on each side of center stripe 1/2 way, throat greenish.

Registered by Charles Marden Fitch, 1120 Cove Road, Mamaroneck, New York:

Amaryllis clone **'Talisman Cove'**; reg. A-672, June 7, 1961 (first distributed 2-25-61). Flower length (depth) 3 3/4″, Leopoldii (D-5a); scape 27″ tall; spring flowering; umbel 4—5-fld; flowers 7 1/2″-8″ in diam.; color rose madder (HCC-23/1) to rose Bengal (HCC-25/1) in throat. Bred from Van Meeuwen strain stock.

Registered by Mr. R. W. Eubank, 1301 York St., Corpus Christi, Texas:

Amaryllis clone **'Eubank's White'**; reg. no. A-668; March 3, 1961. D-5a (Leopoldii); scape 19″-20″ tall; spring flowering, foliage present at flowering; umbel 4-flowered; flower length (sideways) 3—3 1/2″; flower diameter 8—8 1/2″; flower color pure white with light chartreuse green in throat, extending partially into the lower part of segs; stigma trifid.

Registered by Mr. Robert L. Solomon, 3806 42nd St., Tampa 10, Florida:

Amaryllis clone **'Debra Solomon'**; reg. #A-673, June 10, 1961 (first distributed in the spring of 1961). D-5a (Leopoldii), scape 16″ tall; spring flowering umbel 4-flowered; flower length (sideways) 3″; 8″ in diameter; flowers rose Bengal (HCC-25/2 to 25), making a perfect blend, throat deep Bengal rose. An outstanding hybrid. Parentage: un-named Indian hybrid (seed parent), Reg. A-424 (pollen parent).

Amaryllis clone **'Connie Fay'**; reg. #A-677, Aug. 23, 1961. D-8 (Double); scape 15″ tall; spring flowering; foliage present at flowering time; umbel 2-flowered; flower length (sideways) 5″; 7 1/2″ in diameter; flowers semi-double rosy red (chrysanthemum crimson?) with some white markings in center of segs. Parentage unnamed seedl. (seed parent) x 'Friendship' (pollen parent).

Registered by Mr. J. W. Terry, 1107 Mamie St., Hattiesburg, Miss.:

Amaryllis clone **'Eternal Youth'**; reg. A-676, Aug. 19, 1961. D-5a (Leopoldii); scape 20″ tall; spring flowering; foliage present at blooming time, umbel 4-flowered; flower length (sideways) 3 1/2″; flower diameter 8″; flower color-upper setsegs delft rose (HCC-20/1) extending 3/4 length of seg, petsegs to 1/2″ of tip of white; lower setsegs, upper half same as above, lower half lighter, throat greenish-white. Parentage: 'Pink Favorite' (seed parent) x 'Ludwig's Dazzler' (pollen parent).

Registered by Mrs. Donald Mitchel, 1443 Arabella St., New Orleans, La.:

Amaryllis clone **'Donald Mitchel'**; reg. A-675, Aug. 19, 1961. D-5a (Leopoldii); scape 22″ tall; spring flowering; umbel 4-flowered; flower length (sideways) 3 1/2″; flower diameter 9″; flower color Tyrian rose (HCC-24/1), segs enlivened by center white strips; throat greenish-white.

Registered by Mr. W. J. Perrin, 4753 Press Drive, New Orleans 26, La.:

Amaryllis clone **'Grand Mist'**; reg. A-674, July 18, 1961. D-4a (Reginae); scape 18—24" tall; spring flowering; umbel 4-flowered; foliage present at time of flowering; flower length 4 1/2"; flower diameter 7"; flower color misty white with rich green throat, small red markings deep in throat; greenish stripe in center of segs, misty white to the ends. Parentage: 'Maria Goretti' Reg. 445 · x 'White Giant' reg. A-460 ·.

Originated by a South African breeder (**name later**); **and registered in his behalf by Robert D. Goedert, Box 6534, Jacksonville 5, Florida:**

Amaryllis clone **'Fire Bird'**; reg. A-678, Aug. 26, 1961. D-5a (Leopoldii) scape fairly tall; spring flowering; foliage deciduous; umbel 4-flowered; flower diameter 8—9"; bitone, a flaming orange red with darker throat, back of segs white, spotted red.

Amaryllis clone **'Flying Cloud'**; reg. A-679; Aug. 26, 1961. D-5a (Leopoldii); scape fairly tall; spring flowering; foliage deciduous; umbel 4-flowered; flower diameter, about 8"; flower color pure white with green throat.

Originated by a South African breeder (**name later**); **and registered in his behalf by Robert D. Goedert, Box 6534, Jacksonville 5, Florida:**

Amaryllis clone **'Mohawk'**; reg. A-680; Aug. 26, 1961. D-5a (Leopoldii); scape fairly tall; spring flowering; foliage deciduous; umbel 4-flowering; flower diameter about 9"; flower color a light red self.

Amaryllis clone **'White Crane'**; reg. A-681, Aug. 26, 1961. D-5a (Leopoldii); scape very tall; spring flowering; foliage deciduous; umbel 4-flowered; flower diameter about 9"; flower color pure white with near white throat, segs somewhat loosely arranged.

HYBRID NERINE CLONES

The following additions (not registered) to the "Catalog of Nerine Cultivars" have been sent in by Emma D. Menninger, Greenoaks, 730 North Old Ranch Road, Arcadia, Calif. (See PLANT LIFE 17: 61. 1961, for additions up to 1961.)

Name	Grower/Supplier	Description
'Caliph'	G-ER	pink.
'Comet'	S-Barr	salmon scarlet.
'Crusader'	S-Barr	cerise-rose, late.
'Harlequin'	S-Barr	small-flowered salmon, white throat.
'Hailstorm'	G-ER	white.
'Marise'	G-ER	salmon.
'Mrs. C. Goldsmith'	S-Barr	deep blood-crimson.
'Mystic'	S-Barr	light coral to lilac.
'Nile'	G-ER	bright pink.
'Pink Delight'	G-ER	pale pink.

CRINUM ASIATICUM JAPONICUM

TSUNESHIGE ROKUJO, *Tokyo, Japan*

Crinum asiaticum var. *japonicum* is native to south eastern Japan and grows along the coastline facing onto the Pacific Ocean. The northern limit of growth is the Boso Peninsula near Tokyo. Several rather hardy subvariants exist. Presumably the plants were introduced originally on the tropical currents which sweep up along southeastern Asia. The bulbs are not completely winter hardy in Tokyo and some protection is required.

CYTOLOGICAL REPORTS AND THE PLACEMENT OF STERNBERGIA

R. O. Flagg and W. S. Flory

The Blandy Experimental Farm, University of Virginia, Boyce, Va.

Classifications of Amaryllidaceae [1,2,3,4,5,6,7,8,9] have indicated *Sternbergia* W&K (1805) as more nearly allied with American Zephyrantheae than with other Mediterranean amaryllids. In December of 1960 H. P. Traub [10,10a] wrote that he was "moving *Sternbergia* [from Zephyrantheae] to Narcisseae." In considering Zephyrantheae our studies of morphological and distributional data for the taxa involved had already led to serious misgivings [11] about the relationships implied by existing classifications. Under the fillip of Traub's independent action [12], a general review of cytological literature for Mediterranean Amarylloideae was initiated. The following is a short summary of our rather extensive review, together with tentative conclusions. Only the reports of seemingly greatest significance to the placement of *Sternbergia* are mentioned here.

In 1949 Battaglia [13] presented a careful review and report of the cytology of *Sternbergia lutea*, the only member of the genus for which there are cytological reports. In agreement with several previous workers, Battaglia [13] concluded that the basic chromosome number for *S. lutea* is 11. Uncertainties in differing reports were pointed out, and Battaglia produced evidence indicating that Amico's [14] report of 2n=24 chromosomes in *S. lutea* was an error resulting from technique. More recently Mookerjea [15] and Sharma [*16] have reported finding a diploid

* The figures for **S. lutea** used by Sharma (1956) are quite evidently duplicates of those presented by Mookerjea (1955).

complement of 20 chromosomes in *S. lutea*. This suggests that *S. lutea* may have a basic chromosome number of 10 or of 11. The outstanding morphological feature in the cytological reports on *S. lutea* is the occurrence of a preponderance of subterminally constricted (cephalobrachial) chromosomes in the somatic complements. This cytological picture is strikingly different from that presented by representatives of American Zephyrantheae (x = 6) studied in this laboratory.

In 1955 Mookerjea [15] concluded that "*Sternbergia* represents an evolutionary line, possibly an offshoot from the *Allium* stock" while *Habranthus* and *Sprekelia* originated quite differently. This implied exclusion of *Sternbergia* from Zephyrantheae.

Mookerjea [15] did not compare *S. lutea* cytologically with Narcisseae or Galantheae. She placed *Sternbergia* in Galantheae through a misinterpretation of Hutchinson's [7] writing. Hutchinson [7,8] classified *Sternbergia* under Zephyrantheae. His key to the tribes of the Amaryllidaceae was such that *Sternbergia* species could be "keyed out" to either Zephyrantheae or Galantheae. For that reason Hutchinson [7,8] listed the name *Sternbergia* in brackets under Galantheae to show im-

proper placement. Apparently through oversight Mookerjea [15] assumed that Hutchinson [7] assigned *Sternbergia* to Galantheae.

Fernandes[17] has stated that "the data from cytology are not in accord with the idea of considering *Lapiedra* close to *Sternbergia* from the systematic point of view." He regarded *Lapiedra* as closely related to *Leucojum* and *Galanthus* and suggested that *Lapiedra martinezii* and *Leucojum autumnale* originated from a common ancestor [17,18]. Fernandes would apparently exclude *Sternbergia* from Galantheae on a cytological basis.

Fernandes has made extensive cytotaxonomic studies of *Narcissus*. His 1951 paper [19] on the phylogeny of *Narcissus* species summarizes much of that work. Regarding the section *Hermione* Fernandes [19] pointed out "*existence des nombres de bases* 10 *et* 11" and "*dominance dans les garnitures de chromosomes cephalobrachiaux*." A comparison of published drawings shows that this parallel with the cytological reports for *Sternbergia lutea* extends also to chromosome size.

In traditional classifications *Sternbergia* has been excluded from Narcisseae by its lack of a corona or rudiments of a corona. The section *Hermione* not only shows chromosomal similarity to *S. lutea* but also contains those species of *Narcissus* with coronas least developed. Furthermore, the presence and the absence of a corona or rudiments of one are not necessarily significant characters for distinguishing supra-generic groups of amaryllids. This might be most sharply illustrated by the fact that while some collections of *Zephyranthes pulchella* have rudimentary coronal development in the form of squamae visible to the naked eye, e.g. *Clint T-37*, others have none visible even at a magnification of 10X, e.g. *Flagg T-52-P*.

There is both cytological and morphological evidence suggesting that *Sternbergia* should be classified near *Narcissus*. Breeding tests are planned to give additional information on the proper placement of *Sternbergia*.

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Fig. 12. Leaves of Louisiana *Hymenocallis,* (left), *H. eulae,* plant from Castor-Ringgold area (Dormon No. 3); (right) *H. galvestonsis* plant from Prairieville, La. (Dormon No. 1). See text for description.

LOUISIANA HYMENOCALLIS NOTES, 1961

CAROLINE DORMON

The foliage of the native *Hymenocallis* is quite attractive, and the plants do not require as much space as most of the Crinums.

The species from the Castor-Ringgold area is worth growing just for the pretty leaves. The fan is fairly full, (Fig. 12) the glaucous-green blades about 1½ inches wide, slightly recurved. These appear in late winter and die off in late spring. The flowers appear in August. All of the August-blooming species have the glaucous-green foliage. A flower scape of this was figured in 1961 Plant Life, page 41 (from Castor, La.). The bulb is 7.5 inches in circumference, 3 inches long, including neck; leaves are 2 inches wide, 15 to 24 inches long, glaucous; flowers appear in late August. See plant to left, *H. eulae*, in Fig. 12.

The spring-blooming species from South-central Louisiana have shining light-green leaves, about 1 inch or less in width (Fig. 12). These appear in spring, and the flowers bloom with the leaves. The foliage of these is quite similar, and the specimens from near Bunkie and from Lake-Prairieville area may be variations of the same species. A dwarf species from Prairieville, La. (Dormon No. 1) was mentioned in 1961 Plant Life, page 42. The bulb of this is 5.5 in. in circ., 2.5 in. long, including neck; leaves are shining green, 1 in. wide, 9—15 in. long; flowers appear in April. See plant to right, *H. galvestonensis*, in Fig. 12.

LONG LOST AMERICAN **CRINUM** FOUND

HAMILTON P. TRAUB

In 1959, Mrs. Carl Shirley, 1540 Forsythe, of Beaumont, Texas, sent the writer bulbs and seeds of a "large Crinum americanum" which she collected locally in the City of Beaumont on both sides of the Neches River, on the west side in Jefferson County, and on the east bank in Orange County. Mrs. Shirley indicated that the rhizome to which the bulbs were attached were different from those of the common *Crinum americanum*—"without exception the rhizome went down; never laterally as rhizomes usually do. I really do not know how deep they went; we were never able to get to the bottom of them."

The bulbs were potted in an 8-inch earthen pot which was set in a saucer so that it could be given *Crinum americanum* treatment during the growing season. This means that when in active growth, water is liberally applied and is allowed to stand in the saucer. Under this treatment, the larger bulb produced a 3-flowered scape late in September 1961. It proved to be a very lovely, slightly fragrant, *Crinum* with flowers presenting a 'proudly' upright stance. It was possible to match this up with the available meagre descriptions, and with Herbert's plate in Bot. Mag. Lond. 53: pl. 2635. 1816 of *Crinum strictum*, habitat unknown, a plant lost in culture in Europe over a century ago.

Although the habitat of *C. strictum* was apparently unknown, Herbert (in Amaryll. 253-254. 1837) surmised that it was native to Mexico: "I make no doubt of its being a Mexican plant, from whence Mr. Tate, who sent it to me as it arrived (by some mistake labeled as a Neottia from Ceylon), imported many plants at the period. It has no oriental affinities." At the time that it was described in 1816, Texas was part of Mexico. Texas became a republic in 1836, and an American State in 1845. Thus Herbert was apparently technically correct in his surmise. It could have been collected in the general area of the Gulf Coast where Mrs. Shirley found it that is now part of the United States. How far the species ranges southward is not known at present, but it may reach along the Gulf Coast into present day Mexico. Only further exploration can settle this point.

Crinum strictum sets seeds readily and thus can be easily propagated and should be offered by dealers in amaryllids. It is more easily grown than *Crinum americanum*. It has another virtue—it is not too rampant growing and will appeal to those who collect the dwarfer crinums.

Crinum strictum Herbert

Descr. ampl. in Bot. Mag. Lond. 53: pl. 2635. 1816; Amaryll. 253-254. 1837; Baker, Amaryll. 86. 1888. Syn.— **C. herbertianum** Roem. et Schult.f., Syst. **7:** 871. 1830.

Bulb small, ovoid, without any distinct neck. **Leaves** evergreen, 6, suberect, 35—41 cm. long, 4.1—4.3—4.7 cm. wide, narrowly lorate-lanceolate, apex bluntly acute, with hyaline margin, minutely toothed at varying intervals, up to 8 mm. apart, moderate yellow-green (pod green HCC-061). **Scape** flattish, with rounded edges, rusty-reddish in lower 1/3, rest moderate yellow-green, 22.5—30 cm. long, 10 x 13 mm. in diam. at the base, 9 x 11 mm. in diam. at the apex. **Spathe** lanceolate, margins infolded, streaked reddish over moderate yellow-green, 8.5—9 cm. long, 2.2—2.5 cm. wide at the base, tapering to a bluntly acute to truncately-notched apex. **Umbel** 3- or 4-flowerd. **Buds** creamy white streaked reddish in upper 9/10 on outside, upright at first, then nodding slightly below horizontal by rounding of the upper 1/3 of the tepaltube before opening; and then almost upright on opening with the upper ¼ of the tepaltube slightly curved. **Flowers** fragrant, ovary pod green, tepaltube light yellowish-green in lower 9/10, cream-colored in upper 1/10; tepalsegs white, streaked reddish on the outside upper 9/10, stamens and style red in upper ¾; flowers wide open with segs recurved, stamens and style prominently exserted. **Pedicels** 3—4 mm. long **Ovary** oblong 1.4 cm. long, 8 x 9 mm. in diam.; ovules few per cell. **Tepaltube** permanently slightly curved in upper ¼, 8.4 cm. long, 6 x 7 mm. in diam. at the base, 5 x 6 mm. in diam. at the apex. **Tepalsegs** narrowly lanceolate, acute (apiculate), 10.8 cm. long, 1.5 cm. wide. **Stamens** 6.6 cm. long, anthers 1.3 cm. long, pollen yellow. **Style** 3.2 cm. longer than the stamens, **stigma** minute.

Specimen: Traub **888a+b** (TRA), 9-26-61; grown at La Jolla, Calif., from a bulb collected by Mrs. Carl Shirley, in Jefferson County, Texas.

AMARYLLID GENERA AND SPECIES

HAROLD N. MOLDENKE

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time sc that these will be available to the readers.]

Pancratium mexicanum Le Conte, in Ann. Lyceum Nat. Hist. New York 3: 143-144, pl. 4, figs. 1-3. 1836.—Bulb stoloniferous; leaves 6—8, linear-lorate, obtuse, rather concave, somewhat broader at the middle, striate, dorsally convex, not carinate, flat at the apex; scape double, striate, becoming somewhat glaucous, 2—6 flowered; ovary ovatetrigonous, pyramidal; tepaltube subtrigonous, with rounded angles, becoming greenish, striate; petals white, linear, upright, concave, longer than

the tube, the exterior ones canaliculate, becoming greenish beneath; corona white, becoming somewhat greenish at the very base, more or less stellate, irregularly erose at the margin, mostly bearing very many small acuminate mucros; filaments from the sinuses of the corona, incurved, white; anthers vertical, yellow; pistil declinate, incurved, longer than the filaments, green at the apex; capsule withering and splitting into pieces before the maturation of the seeds; seeds increasing in size after the breaking up of the capsule.

(a) Bulb producing only a single scape; leaves 8, 18 inches long; scape 19 inches long; petals subhorizontal; corona at first expanded, funnel-form, finally exactly rotate or disciform, one-third as long as the petals.

(b) Taller; bulb producing only a single scape; leaves 6, 24 inches long; scape 30 inches tall; petals horizontal or even somewhat deflexed; corona funnel-form, occasionally exactly rotate or disk-shaped, scarcely stellate, less than one-third as long as the petals, now and then bearing an acuminate mucro on the margin.

(c) Early-blossoming; bulb always producing two scapes; leaves 6, 12 inches long; scape 12 inches long; petals expanded, not rotate; corona funnel-form, never rotate, half as long as the petals.

(d) Bulb producing only one scape; leaves 6, 12 inches long; scape 12 inches long; petals expanded, subhorizontal; corona exactly rotate, with erose teeth, one-third as long as the petals.

Pancratium coronarium Le Conte, in Ann. Lyceum Nat. Hist. New York 3: 145 pl. 4. figs. 7—9. 1836.—Bulb not stoloniferous, producing one scape; leaves 8, linear-lorate, obtuse, 24 inches long, wider at the middle, striate, dorsally convex, not carinate, canaliculate toward the base and forming a concave semi-cylinder, expanded at the apex; scape 24 inches long, 4-flowered, striate, two-edged, not glaucous; ovary small, ovate-trigonous; tube subtrigonous, with rounded angles, becoming greenish; petals white, not yellowish-white, linear, upright, striate, concave, longer than the corona, canaliculate, the outer ones becoming greenish beneath; corona ample, funnel-form, not rotate, white, stellate, the staminiferous teeth broad, entire, bearing an acuminate tooth on both sides, the sinuses deep, irregularly erose-dentate, the very base green-stellate, finally yellowish-white; filaments one-third as long as the corona, from the coronal teeth, incurved, white; anthers vertical, yellow; pistil green toward the apex, declinate, incurved, scarcely longer than the filaments; capsule splitting into pieces and withering before the maturation of the seeds; seeds increasing in size after the breaking up of the capsule.

Pancratium rotatum Le Conte, in Ann. Lyceum Nat. Hist. New York 3: 144, pl. 4, figs. 4—5. 1836.—Bulb stoloniferous, producing one scape; leaves 8, linear-lorate, obtuse, 18 inches long, wider at the middle, striate, rather concave, dorsally convex, not carinate, flat at the apex; scape 18 inches long, 4-flowered, two-edged, glaucous, striate; ovary oblong-ovate, subtrigonous; (tepal) tube subtrigonous, with rounded angles, becoming pale greenish; petals yellowish-white, striate, linear, upright, horizontal, or even subrecurved, concave, somewhat canaliculate, twice as long as the corona, involute at the margins, the outer ones becoming greenish beneath; corona white, becoming greenish at the very base, funnel-form, sometimes exactly rotate, never disk-form, with rather deep sinuses, irregularly erose at the margin, the teeth staminiferous, mostly truncate; filaments issuing from the coronal teeth, incurved, white, anthers vertical, yellow; pistil green, declinate, incurved, longer than the filaments; capsule remaining unbroken to the maturation of the seed.

(b) Smaller in all parts.

Crinum strictum var. traubii Moldenke, **var. nov.**

Foliis sempervirentibus usque ad 9 loratis glabris atroviridibus usque ad 61 cm. longis, 6.7 cm. latis, apice obtuse acutis, marginibus sparse minuteque dentatis; scapo 43.5 cm. alto; spatha lanceolata 6.5 cm. longa; umbella 6-flora; floribus albis aspectu, sed tubo tepalorum rubiginoso-rubello vel pallide flavidulo-viridi, sub apice pallidissime rubello-alboluteseenti; duobus partibus superioribus staminorum stylique purpureo-rubris, stylo interdum usque ad gulam purpureo; alabastris ante anthesin declinatis sed tubo tepalorum per anthesin erecto prope apici paulo curvato; pedicellis 9 mm. longis; ovaria 1.2 cm. longo; tubo tepalorum 11.3 cm. longo; segmentis tepalorum oblanceolatis 9.2—9.4 cm.

longis, 1.5—1.6 cm. latis; filamentis 5.4—5.6 cm. longis; staminibus styloque divergentibus curvatis; antheris 1 cm. longis; stylo stamina excedenti; stigmate minuto.

Specimens: Traub **575a - b,** 8-20-57; Traub **675a - b,** 9-30-58, holotype (TRA), grown from bulbs collected by Ruth Patrick Hodge, 5 mi. n. Beaumont, Hardin County, Texas, July 5, 1952. See also Plant Life 14: 51—52, fig. 7. 1958. It differs from **Crinum strictum** Herb., in a number of particulars—the umbel is 7-fld, the foliage is longer and deep green in color, the flowers in the umbel are not held "proudly upright," etc.

CLASSIFICATION OF THE AMARYLLIDACEAE

Hamilton P. Traub

Since the publication of the writer's last revision of the AMARYLLIDACEAE (Traub, 1957), additional study has indicated some necessary changes which are included in the classification presented below. The tribe MILULEAE in the subfamily ALLIOIDEAE has been added in harmony with the interpretation of Stearn (1960). The genus *Sternbergia* has been removed from the tribe ZEPHYRANTHEAE and placed in the tribe NARCISSEAE (Traub, 1961). The genera *Elisena* and *Pseudostenomesson* have been reduced to the synonymy of the genus *Hymenocallis* (Traub, 1962). Still other changes have been made to bring the classification up-to-date. It should also be noted that the subfamily AMARYLLOIDEAE has been divided into two infrafamilies and this is apparently justified on the basis of the morphological and chromosome data.

I. CLASSIFICATION OF THE AMARYLLIDACEAE—SUBFAMILIES AND TRIBES

Family **AMARYLLIDACEAE** (105 genera; 1,644 species)

1a. Ovary superior:

2a. Inflorescence spicitate or umbellate (30 genera; 714 species) ....SUBFAMILY I. **ALLIOIDEAE**
x= 5, 6, 7, 8, 9, 10, 11, 15

3a. Flowers actinomorphic, except in **Agapanthus** in the Tribe Apapantheae:

4a. Inflorescence spicitate (1 genus; 1 species) . . ..Tribe 1. **MILULEAE** x=?

4b. Inflorescence umbellate:

5a. Rootstock usually a corm or bulb (18 genera; 712 species) . . ..Tribe 2. **ALLIEAE**
x= 5, 6, 7, 8, 9

5b. Rootstock a rhizome or sub-bulbous in **Tulbaghia** (2 genera; 34 species). .Tribe 3. **AGAPANTHEAE**
x= 6, 15

3b. Flowers usually zygomorphic; sometimes actinomorphic (9 genera; 14 species) . . . . Tribe 4. **GILLIESIEAE**
x = 10, (11)

2b. Inflorescence a raceme, a bostryx, subumbellate; or terminal solitary flowers on a scape (3 genera; 17 species) ....SUBFAMILY II. **HEMEROCALLOIDEAE**
x= 11, 12, 14
Tribe 5. **HEMEROCALLEAE**
x= 11, 12, 14

1b. Ovary inferior:

6a. Scape leafy in the lower part, inflorescence sub-umbellate (2 genera; 3 species) ....SUBFAMILY III. **IXIOLIRIOIDEAE**
x= 12
Tribe 6. **IXIOLIRIEAE**
x= 12

6b. Scape not leafy; inflorescence umbellate; (70 genera; 930 spp.) ....SUBFAMILY IV. **AMARYLLOIDEAE**

7a. Filaments usually not markedly modified; if modified, then usually not conspicuously so (45 genera; 768 species) INFRAFAMILY I. **AMARYLLOIDINAE**

8a. Fruit not baccate (except in **Gethyllis** under **Gethylleae**, below)

9a. Bulb coats when broken do not reveal minute fibers:

10a. Anthers schistandrous (see also **Lapiedra** under **Galantheae**):

11a. Paraperigone; if present, usually not conspicuous, except in Placea in tribe Amarylleae (see also **Sternbergia** under Narcisseae, below).

12a. Spathe united into a tube for part of its length below, except in **Rhodophiala** (8 genera; 128 spp.) ....Tribe 7. **ZEPHYRANTHEAE**

12b. Spathe-valves free (see also **Rhodophiala** under 12a, above):

13a. Tepaltube usually not enlarging markedly toward the apex; tepalsegs longer than the tepaltube:

14a. Scape solid (3 genera; 30 spp.) . ...Tribe 8. **LYCOREAE**

14b. Scape hollow (3 genera; 55 spp.) . . ..Tribe 9. **AMARYLLEAE**

13b. Tepaltube usually enlarging markedly toward the apex; tepalsegs usually shorter than the tepaltube (5 genera; 53 spp.) ....Tribe 10. **CYRTANTHEAE**

11b. Paraperigone usually present and conspicuous, except in **Sternbergia** (5 genera; 28 spp.) . . ..Tribe 11. **NARCISSEAE**

10b. Anthers porandrous, except in **Lapiedra** (3 genera; 23 spp.)....Tribe 12. **GALANTHEAE**

9b. Bulb coats when broken reveal minute fibers, except in secondarily cartilaginously thickened coats:

15a. Plants usually relatively larger (8 genera; 311 spp.) ....Tribe 13. **CRINEAE**

15b. Plants relatively smaller.

16a. Fruit baccate, except in **Apodolirion** (3 genera; 28 spp.) ..... Tribe 14. **GETHYLLEAE**

16b. Fruit not baccate (3 genera; 23 spp.) . ...Tribe 15. **HESSEAE**

8b. Fruit baccate (see also **Gethyllis** under Gethylleae, above), (4 genera; 89 spp.) . . . .Tribe 16. HAEMANTHEAE

7b. Filaments usually markedly modified (25 genera; 162 species) ....INFRAFAMILY II. **PANCRATIOIDINAE**

17a. Scape solid; filaments often modified into a conspicuous cup:

18a. Seeds flat, winged, or angular, hard (7 genera; 48 spp.) .... Tribe 17. **PANCRATIEAE**

18b. Seeds fleshy, oval or angular (8 genera; 90 spp.) .... Tribe 18. **EUCHAREAE**

17b. Scape hollow; filaments usually variously modified, but not into a staminal cup; or scales on inner surface of tepaltube:

19a. Scales on inner surface of tepaltube (1 genus; 1 spp.) .... Tribe 19. **LEPIDOPHARYNGEAE**

19b. Filaments usually variously modified (9 genera; 23 spp.)........... Tribe 20. **EUSTEPHIEAE**

II. GROUPING OF GENERA UNDER SUBFAMILIES, INFRAFAMILIES, TRIBES

Subfamily I. **ALLIOIDEAE** (714 spp.) x= 5, 6, 7, 8, 9, 10, 11, 15
Tribe 1. **MILULEAE** (1 sp.) x=?
1. MILULA (1 sp.) x= ?

Tribe 2. **ALLIEAE** (665 spp.) x= 5, 6, 7, 8, 9
Subtribe 1. **ALLIINAE** (614 spp.) 6, 7, 8, 9
2. ALLIUM (550 spp.) x= 7, 8, 9
3. NOTHOSCORDUM (17 spp.) x= 8, 9
4. STEINMANNIA (1 sp.) x= ?
5. IPHEION (24 spp.) x= 6
6. TRISTAGMA (7 spp.) x= ?
7. LEUCOCORYNE (14 spp.) x= ?
8. LATACE (1 sp.) x= ?

Subtribe 2. **BRODIAEINAE** (41 spp.) x= 5, 6, 7, 8, 9
9. MUILLA (4 spp.) x= ?
10. ANDROSTEPHIUM (2 spp.) x= ?
11. TRITELEIOPSIS (1 sp.) x= ?
12. TRITELEIA (15 spp.) x= 5, 7, 8
13. BLOOMERIA (2 spp.) x= 9
14. BRODIAEA (10 spp.) x= 5, 6, 7, 8
15. DICHELOSTEMMA (6 spp.) x= 8, 9

Subtribe 3. **MILLINAE** (10 spp.) x=?
16. DANDYA (1 sp.) x= ?
17. BESSERA (2 spp.) x= ?
18. PETRONYMPHE (1 sp.) x= ?
19. MILLA (6 spp.) x= ?

Tribe 3. **AGAPANTHEAE** (34 spp.) x= 6, 15
20. TULBAGHIA (25 spp.) x= 6
21. AGAPANTHUS (9 spp.) x= 15

Tribe 4. **GILLIESIEAE** (14 spp.) x= 10, (11)
22. SPEEA (1 sp.) x= ?
23. SCHICKENDANTZIELLA (1 sp.) x= ?
24. TRICHLORA (1 sp.) x= ?
25. ERINNA (1 sp.) x= ?
26. SOLARIA (2 spp.) x= ?
27. MIERSIA (2 spp.) x= 10, (11)
28. GETHYUM (1 sp.) x= ?
29. GILLIESIA (4 spp.) x= ?
30. ANCRUMIA (1 sp.) x= ?

Subfamily II. **HEMEROCALLOIDEAE** (17 spp.) x= 11, 12, 14
Tribe 5. **HEMEROCALLEAE** (17 spp.) x= 11, 12, 14
31. HEMEROCALLIS (15 spp.) x= 11
32. HESPEROCALLIS (1 sp.) x= 12
33. LEUCOCRINUM (1sp.) x= 14

Subfamily III. **IXIOLIRIOIDEAE** (3 spp.) x= 12
Tribe 6. **IXIOLIRIEAE** (3 spp.) x= 12
34. IXIOLIRION (1 sp.) x= 12
35. KOLKAPOWSKIA (2 spp.) x= ?

Subfamily IV. **AMARYLLOIDEAE** (930 spp.) x= 6, 7, 8, 9, 10, 11, 12, 14, 15, 22, 23, 26, 34, 37

INFRAFAMILY I. **AMARYLLOIDINAE** (768 spp.) x= 6, 7, 8, 9, 10, 11, 12, 14, 15

Tribe 7. **ZEPHYRANTHEAE** (128 spp.) x= 6, 7, 9, 11
36. ZEPHYRANTHES (62 spp.) x= 6
37. PYROLIRION (11 spp.) x= 7
38. HAYLOCKIA (1 sp.) x= ?
39. HABRANTHUS (19 spp.) x= 6, 11
40. SPREKELIA (1 sp.) x= ?
41. RHODOPHIALA (31 spp.) x= 9
42. X RHODOBRANTHUS (1 sp.) x= ?
43. X SYDNEYA (2 spp.) x= ?

Tribe 8. **LYCOREAE** (30 spp.) x= 6, 7, 8, 9, 11, 12, 15
44. UNGERNIA (8 spp.) x= 12
45. LYCORIS (15 spp.) x= 7, 8, 9, 11, 15
46. GRIFFINIA (7 spp.) x= ?

Tribe 9. **AMARYLLEAE** (55 spp.) x= 11
47. WORSLEYA (1 spp.) x= ?
48. AMARYLLIS (48 spp.) x= 11
49. PLACEA (6 spp.) x= ?

Tribe 10. **CYRTANTHEAE** (53 spp.) x= 8, 11
50. HANNONIA (1 sp.) x= ?
51. ANOIGANTHUS (5 spp.) x= 8
52. VALLOTA (1 sp.) x= 8
53. CYRTANTHUS (45 spp.) x= 8, 11
54. X VALLOTANTHUS (1 sp.) x= ?

Tribe 11. **NARCISSEAE** (28 spp.) x= 7, 10, 11, 12, 14
55. STERNBERGIA (5 spp.) x= 11, 12
56. NARCISSUS (22 spp.) x= 7, 10, 11
57. TAPEINANTHUS (1 sp.) x= (7), 14

Tribe 12. **GALANTHEAE** (23 spp.) x= 7, 8, 9, 11, 12
58. LEUCOJUM (11 spp.) x= 7, 8, 9, 11
59. LAPIEDRA (2 spp.) x= 11
60. GALANTHUS (10 spp.) x= 12

Tribe 13. **CRINEAE** (311 spp.) x= 11, 12
61. CRINUM (148 spp.) x= 11
62. BRUNSVIGIA (16 spp.) x= 11
63. NERINE (35 spp.) x= 11, 12
64. X CRINODONNA (2 spp.) x= ?
65. X BRUNSERINE (2 spp.) x= ?
66. BOOPHONE (2 spp.) x= ?
67. AMMOCHARIS (5 spp.) x= 11
68. CYBISTETES (1 sp.) x= 11

Tribe 14. **GETHYLLEAE** (28 spp.) x= ?
69. APODOLIRION (6 spp.) x= ?
70. GETHYLLIS (21 spp.) x= ?
71. KLIINGIA (1 sp.) x= ?

Tribe 15. **HESSEAE** (23 spp.) x= ?
72. HESSEA (15 spp.) x= ?
73. CARPOLYZA (1 sp.) x= ?
74. STRUMARIA (7 spp.) x= ?

Tribe 16. **HAEMANTHEAE** (89 spp.) x= 8, 9, 11, 12
75. HAEMANTHUS (77 spp.) x= 8, 9
76. CLIVIA (5 spp.) x= 11
77. CHOANANTHUS (2 spp.) x= ?
78. CRYPTOSTEPHANUS (5 spp.) x= 12

INFRAFAMILY II. **PANCRATIOIDINAE** (162 spp.) x= 10, 11, 12, 20, 22, 23, 26, 34, 37

Tribe 17. **PANCRATIEAE** (48 spp.) x= 10, 11, 23
79. CHLIDANTHUS (3 spp.) x= 10
80. RAUHIA (1 sp.) x= ?
81. VAGARIA (1 sp.) x= ?
82. PANCRATIUM (20 spp.) x= 11, 12
83. PARAMONGAIA (1 sp.) x= ?
84. PAMIANTHE (1 sp.) x= 23
85. STENOMESSON (21 spp.) x= ?

Tribe 18. **EUCHAREAE** (90 spp.) x= 10, 11, 12, 20, 22, 23, 26, 37
86. HYLINE (2 spp.) x= 10
87. URECOLINA (3 spp.) x= ?
88. EUCHARIS (21 spp.) x= 11, 34
89. PLAGIOLIRION (1 sp.) x= ?
90. CALLIPHRURIA (2 spp.) x= ?
91. HYMENOCALLIS (56 spp.) 12, 20, 22, 23, 26, 37
92. CALOSTEMMA (3 spp.) x= ?
93. EURYCLES (2 spp.) x= 10

Tribe 19. **LEPIDOPHARYNGINEAE** (1 sp.) x= ?
94. LEPIDOPHARYNX (1 sp.) x= ?

Tribe 20. **EUSTEPHIEAE** (23 spp.) x= 23
95. PHAEDRANASSA (5 spp.) x= 23
96. CASTELLANOA (1 sp.) x= ?
97. CALLIPSYCHE (3 spp.) x= ?
98. PHYCELLA (7 spp.) x= ?
99. EUSTEPHIA (2 spp.) x= ?
100. HIERONYMIELLA (1 sp.) x= ?
101. STRICKLANDIA (1 sp.) x= ?
102. EUCROSIA (1 sp.) x= ?
103. EUSTEPHIOPSIS (2 spp.) x= ?

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————. Revision of **Sternbergia.** Plant Life **17:** 59, fig. 10. 1961.

————. Key to the subgenera, alliances and species of **Hymenocallis.** Plant Life **18:** 86—117. 1962.

[PLANT LIFE LIBRARY, continued from page 27.]

SOUTHERN CALIFORNIA GARDENS, by Victoria Padilla. Univ. California Press, Berkeley and Los Angeles. 1961. Illus. pp. 377. $10.00. This attractive new book was written for the lay reader who gardens in southern California. The account begins with a general coverage of the topography, climatic regions, and the settlers in southern California. It proceeds on the basis of five historical periods from the Spanish-Mexican period, 1769—1847 on through the other periods to the recent period of expanding industrialism, 1935—1958. This is followed by an evaluation of the contributions of outstanding horticulturists; and the account concludes with the consideration of the trees, the rose, cacti and succulents, the flower industry, cut flower business, parks and botanical gardens, and the evolution of gardening in southern California. There are various notes; an appendix of climatic data; a selected bibliography; a general index and an index of plant names (these two indices should be combined for ease in using). It is to be expected that some outstanding omissions should occur in a first edition. Absent is the consideration of the bulbous plants for the winter-rainfall garden, a type of gardening so well-suited to the area; and the amaryllids and other bulbous plants for the spring and summer irrigated garden. There is no reference to George Compère who first hybridized *Amaryllis* (syn.- *Hippeastrum*) in southern California, and from whom the Howards got their first stock. The names of plants are sometimes out of date or non-existent: X *Crinodonna* is given as *Amarcrinum*, a synonym. The non-existent name "Brunsvigia immaculata" is used for *Amaryllis immaculata* (syn.- *Hippeastrum candidum*). No mention is made of *Brunsvigia* x *parkeri*, the outstanding hybrids so well-suited to the area. The development of the polyploid *Hemerocallis* in the decade ending in 1958 is not mentioned; and no reference is made to Mrs. Emma D. Menninger's outstanding hybrid Nerines. Other cases will be noted. These constructive suggestions should not be interpreted as detracting from the book as a whole since these can be ironed out in the next edition. This excellent book, beautifully illustrated, will be welcomed by all who are interested in California gardening; and it is highly recommended.

[PLANT LIFE LIBRARY, continued on page 72.]

KEY TO THE SUBGENERA, ALLIANCES AND SPECIES OF **HYMENOCALLIS**

Hamilton P. Traub

I. INTRODUCTION

The genus *Hymenocallis* was founded by Salisbury in 1812 by segregating from the genus *Pancratium* several species native to America. Herbert (1837) recognized the genus *Hymenocallis* (14 species) and related genera *Choretis* Herb. (2 species), *Ismene* Herb. (4 species and 1 hybrid), and *Elisena* Herb. (1 species). Baker (1888) reduced *Choretis* and *Ismene* to the synonymy of an enlarged genus *Hymenocallis* (31 species), but recognized the genus *Elisena* (3 species) as distinct. Sealy (1937) proposed the monotypic genus *Leptochiton* * by segregating *Hymenocallis quitoensis* from the subgenus *Ismene*. Velarde (1949) proposed the genus *Pseudostenomesson* (2 species). Recently Sealy (1954) published a valuable revision of what is here recognized as the subgenus *Hymenocallis* of the genus *Hymenocallis*, largely on the basis of the dried specimens in the Kew and British Museum herbaria. On that basis it was not possible for him to fill in the very great gap concerning the *Hymenocallis* species of the southeastern United States, but we are none the less grateful to him for his revision, particularly for the thorough literature search. When no new data are available, Sealy's revision is followed in the key presented here. The key is summarized from the writer's unpublished manuscript of the AMARYLLIDACEAE at the request of members of the SOCIETY. It is presented with special reference to the *Hymenocallis* species of the southeastern United States. It is one of a series to be published by the writer on *Hymenocallis* during the next several years.

In the key, the genera *Leptochiton* *, *Elisena*, *Pseudostenomesson* and *Ismene* have been reduced to the rank of subgenera of the genus *Hymenocallis*. This disposition of the taxa (Fig. 13) is apparently justified on the basis of the morphological characters (see text discussions and the key), the breeding behavior, and the chromosome data (Table 1).

The floral and vegetative characters of the plants included are similar in general outline, with various minor differences of subgeneric and specific importance. This conforms to the Adansonian principle (Adanson, 1763-64; Sneath, 1957) that all of the characters are to be considered in classifying organisms. Thus the classification of the species of *Hymenocallis* is a very difficult task.

In the subgenera *Hymenocallis, Elisena* and *Pseudostenomesson,* the stamens are more or less straight, but in *Ismene* they are incurved. The staminal cup is straight in all subgenera, except in *Elisena,* where it is initially straight but ultimately permanently deflexed at right angles to the ovary and tepaltube. The flowers are held horizontally to suberect, except in *Pseudostenomesson,* in which they are pendulous. These slight differences, together with other slight differences, are used in the key to set the subgenera part.

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* **Leptochiton** was proposed on an untenable basis. In **Hymenocallis** the ovules have central placentation, that is, the ovules are attached at right angles to the length of the ovary in the center in a double row in each cell. When there are 18—20 ovules per cell, as in **H. quitoensis** (syn.- **Leptochiton quitoensis**), they are attached to a relatively long central axis. In the **Henryae Alliance** (of subgenus **Hymenocallis**), for example, where there are 6—9, rarely 4—5, ovules per cell, in a double row, the central axis is somewhat shorter and it is without ovules in the upper part. Finally, in the **Caroliniana Alliance** (of the subgenus **Hymenocallis**), for instance where there are 2, rarely or 3, ovules per cell (opposite each other when there are 2), they are attached at the extreme base of the axis. Thus there is a **quantitative** rather than a qualitative difference involved, and this is not of generic importance. Thus **Leptochiton** (Bot. Mag. Lond. pl. 9491. 1937) has to be abandoned. The difference between **Hymenocallis**, on the one hand, and **Pancratium** and **Pamianthe**, on the other, with reference to ovules, is that in the first they develop into large **fleshy**, green or whitish-greenish seeds, and in the latter two into **hard**, black, angular, or **hard**, black, flat seeds.

II. MORPHOLOGICAL CONSIDERATIONS

The writer began the intensive study of the *Hymenocallis* species of the southeastern United States in the 1930's. The study was pursued as time permitted over the years. He soon found that this group presented one of the most difficult problems in taxonomy. The floral parts are extremely delicate and the herbarium specimens made by the usual method, which serves well for most plants, and has not been markedly changed over a long period, does give very poor results when applied to *Hymenocallis* unless great care is taken. It was realized that a method had to be devised to preserve the delicate floral parts in a more satisfactory condition. After experimentation, a satisfactory method—drying the delicate parts between a sandwich of *cellulose acetate*—was devised (Traub, 1950; 1951). This proved to be equally applicable to other amaryllids with which he is working. Thus it was possible to attack the problem of the southeastern United States *Hymenocallis* effectively. In addition, it was clear that the plants had to be studied in the living condition whenever practicable, and that descriptions should be made from living material whenever possible.

The studies were started in Florida in the 1930's, where the plants were studied in the wild; and were continued under greenhouse conditions at Beltsville, Maryland, in the 1940's to 1952. From 1952 to 1954, the work was continued at Arcadia, Calif., under greenhouse conditions, and thereafter, up to the present time, the plants have been grown in a frost-free spot on the Pacific Ocean at La Jolla, Calif. Records were made from living plants, and these were then preserved according to the new method. Thus a reliable permanent record was accumulated for later reference.

This project could not have been successfully pursued had it not been for the energy and foresight of Mrs. Mary G. Henry, who first made a comprehensive collection of living *Hymenocallis* species of the southeastern United States beginning in the 1930's. This material was naturalized at the Henry Arboretum, at Gladwyne, Penna. Mrs. Henry generously shared this material with the writer. Mrs. Morris Clint, Brownsville, Texas, and Dr. Thad Howard, San Antonio, Texas, collected *Hymenocallis* species in Mexico, and Miss Caroline Dormon, Saline, La., collected Louisiana *Hymenocallis*, which they shared with the writer. Dr. W. S. Flory, Jr., furnished three *Hymenocallis* bulbs. The writer is most grateful to all of these cooperators who made the study possible.

Unfortunately, in many cases, species of *Hymenocallis* were proposed—Rafinesque, Herbert, Small—often without an adequate knowledge of the group as a whole, and/or with such haphazard descriptions that it is not possible to connect them definitely with even the living plants should they be available. It should be noted that Small (1933) proposed six species. Typical of these is *H. kimballiae* Small, *nom. subnudum* (1933). It is so haphazardly characterized that it has to be ranked as a *nomen subnudum*. It could only be validated if the type could be found at the New York Botanical Garden, or if living material could be had. The type was unavailable, but Mrs. Henry obtained living material from Mrs. *Kimball*, of Mobile, Ala. When this bloomed for the writer in 1955, a new description was made and published, and thus the name was validated (Plant Life 12: 44-46. 1956). However, for purposes of priority, the date of validation (1956) is effective, and not the year 1933. The remaining five species proposed by Small are in the same category. So far none have been validated, but Sealy (1954) has reduced them to the synonymy of various other species.

Method of procedure.—Thus it is clear that a fresh start had to be made on the basis of living material and adequately preserved herbarium specimens. Once various species could be recognized on such a basis, then it would be possible to go back to the published names in order to recognize priority whenever possible. Only later could the dried specimens in the herbaria of the southeastern United States be studied in an attempt to attach the correct names to the plants represented.

The method of procedure was as follows: The characters of the plants as revealed in the descriptions made from living plants, reinforced by the specimens made by the new method, were tabulated. This at once revealed that there was a very wide range in flowering dates—from April to October and later. Thus gene exchange would be effectively blocked in cases of taxa with blooming dates that did not overlap. The first grouping was on that basis. It brought together speci-

mens of several taxa which had to be sorted out on the basis of morphological characrers into tentative 'species'. The whole *Hymenocallis* complex of the southeastern United States had been named 'Caroliniana Alliance', but after the tentative species had been segregated, it was plain that more than one alliance was involved. The ovary of one group was usually globose, rarely somewhat oblongish, with 2, rarely 1 or 3, ovules per cell, and in the other group, the ovary was definitely oblong, rarely somewhat pyriform, with usually 6—9 ovules per cell. Other characters were correlated with these two groups as shown in the key. The first, containing *H. caroliniana* (L.) Herb., was named the CAROLINIANA ALLIANCE, and the second, containing the new species *H. henryae*, was named the HENRYAE ALLIANCE. This further clarified the matters.

The final stage was concerned in definitely defining the species in each of these two alliances. They were given tentative names. The taxa were then checked with descriptions in the literature in order to apply the first valid name for each.

It is obvious that it has not been possible to integrate the *Hymenocallis* specimens in the herbaria in this first report, but this will follow later. A start is being made with the study of the specimens in the U. S. National Herbarium, the Missouri Botanical Garden Herbarium, the Florida Experiment Station Herbarium, the University of Georgia Herbarium, and the Southern Methodist University Herbarium.

Hymenocallis caroliniana.—The writer follows the lead of Sealy (1954) in recognizing the Linnean name *Pancratium carolinianum* (=*Hymenocallis caroliniana* (L.) Herb.) which is based on the account and figure by Catesby in 1731. The plant collected by Howell in Alabama in 1913, that Sealy connected with the name was not represented in the many collections of Mrs. Henry. However, a wide-ranging taxon—from Georgia and Kentucky westward to southern Missouri, Arkansas and Louisiana—was revealed which is apparently the one represented by Catesby's account and figure. This is 4—9-flowered, rarely 3-flowered on young bulbs attached to the mother bulb; tepaltube (5.2—6.2)—6.7—12 cm. long; staminal cup 3.3—4 cm. long; filaments 2.3—3.5 cm. long. The Howell plant—umbel 5—7-flowered; tepaltube 4.5—5.5cm. long; cup 4—4.5 cm. long; filaments 1.3—1.4 cm. long—may be a depauperate specimen of *H. caroliniana* as interpreted here, but the difference in the length of the filaments seems to be rather extreme. For the present, the disposition of the Howell plant will be left open in the hope that it may be found again.

It now remains to indicate briefly the evolutionary trends for the genera *Hyline* and *Hymenocallis*. The comments here will be confined to the 'alliances' of the subgenus *Hymenocallis* of the genus *Hymenocallis*—the subgenera *Elisena*, *Pseudostenomesson* and *Ismene* have been briefly mentioned above, and are characterized more fully in the key at the end of the paper.

THE GENUS HYLINE

The genus *Hyline* is reported to have no tepaltube, a point which has to be checked in living plants now under cultivation in the writer's garden. *Hyline* is relatively primitive in having many ovules per locule, but as has been indicated above, this is a quantative character and has to be considered with care with reference to generic distinctions. In other respects it is nearest to the species in the Caribaea Alliance (in subgenus *Hymenocallis* of the genus *Hymenocallis*). It is a tropical Brasilian genus requiring much moisture.

GENUS HYMENOCALLIS—SUBGENUS HYMENOCALLIS

I. CARIBAEA ALLIANCE.—These are tropical and subtropical species that require much moisture; distributed in the West Indes, the Mexican Gulf-rim, the northern coast of South America, and some parts of peninsular and western Florida. They have sessile, evergreen leaves, and the floral characters are much alike. The group as shown in the key needs further revision.

II. LITTORALIS ALLIANCE.—This group is apparently an offshoot from the same stock that gave rise to the Caribaea Alliance (Fig. 13). The bases of the tepalsegs are shortly adnate to the base of the staminal cup. There are three ecological groups—one, with evergreen leaves, requires much moisture throughout the year and is confined to the humid Gulf-rim of Mexico and the northern coast of South America—*H. littoralis*—and West Africa—*H. senegambica*. The second group, also with evergreen leaves is found in river beds that may be dry for part

of the year—*H. acutifolia.* The third, with deciduous leaves, is found in interior Mexico.—*H. riparia.* This alliance also needs further revision.

III. CAROLINIANA ALLIANCE.—This group has been mentioned above. It is distributed over a very great area having semi- to subtropical conditions in its southern range, and temperate conditions in its northern range. This group is characterized by an evolutionary explosion (see Table 1). At least one species, *H. caroliniana,* is highly variable within limits. The widely varying climatic and

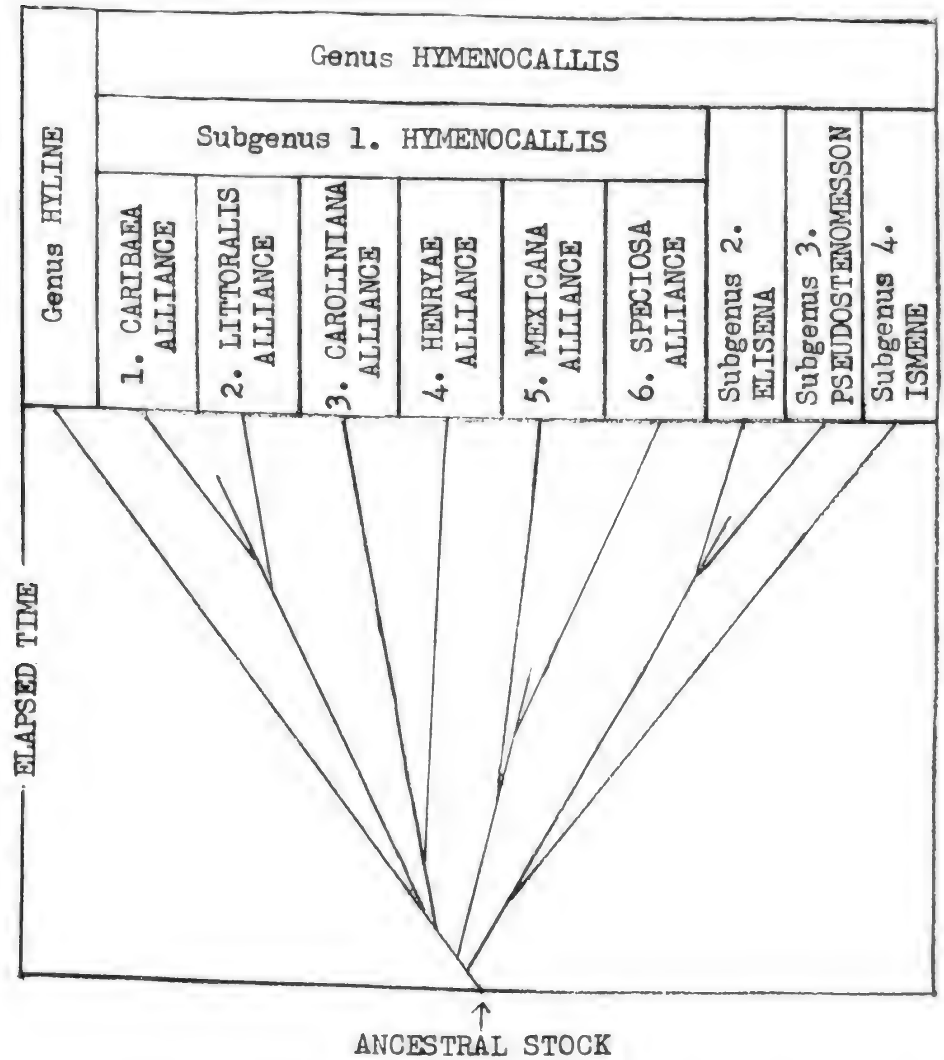

Fig. 13. A generalized diagram to illustrate a postulated phylogeny of the genus *Hyline,* and the infrageneric groups of the genus *Hymenocallis,* with the lineages plotted against time. See text discussion.

soil conditions apparently are factors in the evolutionary process through natural selection. This subject will be discussed under caryological data below. This Alliance has the largest number of species—all with deciduous leaves. Although a fresh start has been made in delimiting the species, this group will be revised further in future reports.

IV. HENRYAE ALLIANCE.—This group is confined to peninsular and west Florida. The species are characterized by the oblong to somewhat pyriform ovary which is correlated with a relatively larger number of ovules as contrasted with a lesser number for the Caroliniana Alliance.

V. MEXICANA ALLIANCE.—This group is characterized by the deciduous, usually broadly-elliptic, elliptic-lorate, etc., sometimes sub-petiolate rarely sub-linear leaves, and is confined to Mexico. It tolerates dry conditions during part of the year, and bloom during the rainy season.

VI. SPECIOSA ALLIANCE.—This group is confined to the West Indies, and the humid coastal Gulf-rim of Mexico and northern South America. They are shade plants which have specialized in distinctively evergreen petiolate leaves.

III. BREEDING BEHAVIOR

This subject can be considered here only briefly for want of space. The species of the Andean section intercross to a considerable extent. *H. narcissiflora* of the Andean section has been crossed with *H. speciosa* of the subgenus *Hymenocallis,* and other crosses of this kind have been reported with other species, but data on flowering is indefinite. Sufficient work has been performed to show that there is potential gene exchange within the genus and that these plants are thus phylogenetically related.

IV. CARYOLOGICAL DATA

Since 1932, reports of the chromosome numbers of *Hymenocallis* species have been published by various authors. These data have never been grouped under infrageneric natural groups and thus their significance has not been fully realized. Now that the infrageneric taxa and the species have been delimited as outlined in the previous sections and the morphological data have been summarized in the key that follows, it is possible to group the available chromosome data according to these taxa and thus to test them (see Table 1).

Chromosome numbers have been reported for all of the subgeneric groups, except for the Henryae Alliance, and the subgenus Pseudostenomesson. The data indicate that the basic chromosome number for the genus as a whole is apparently $x=12$ (as found as a relict example in *H. quitoensis* in the subgenus *Ismene*). From the $2n=24$ level apparently the polyploid numbers of the various species have evolved. This indicates that in *Hymenocallis* not only gene mutations but also polyploidy has been and is an important factor in the evolution of the genus. Once the polyploid level was reached, then apparently secondary basic numbers, $x=20$, 22, 23, 26, 37, have evolved. On the basis of the published data, the *normal* diploid numbers have a very wide range, $2n=24$, 40, 44, 46, 48, 52, 69 and 74, not taking into consideration the variation in *somatic* numbers which again cover a wide range. This great variability is evidence that the genus *Hymenocallis* as a whole has, and is, undergoing marked evolutionary change. This is also indicated by the necessity of recognizing six alliances under the subgenus *Hymenocallis.* As indicated previously, there has been an evolutionary explosion—as shown by the morphological characters—in the Caroliniana Alliance, and this is borne out also by the chromosome data which show a wide range—$2n=40$, 44, 52 and 69. However, this evolutionary process, as shown by the chromosome data, has not been equally intense for all Alliances. There is relative uniformity—$2n=46$—in the reported numbers for the Speciosa Alliance. There apparently gene mutation is now the more important factor in evolution.

Dr. W. S. Flory, Jr., and his associates at Blandy Experimental Farm, University of Virginia, have been studying the chromosomes of the same material used by the writer whenever possible, and they will report their findings in a separate paper.

Table 1. Catalog of Chromosome Numbers—Genera **Hyline** and **Hymenocallis.**

Genus, subgenus and species	Normal somatic number (2n)	Variation in somatic number (2n)	Authority (See Literature cited)
Genus **Hyline**, x= 10			
Hy. gardneriana	20		Mookerjea, 1955
Genus **Hymenocallis**, x= 12,* 20,** 22,** 23,** 26,** 37**			
Subgenus 1. **Hymenocallis**, x= 12, 20, 22, 23, 26			
1. **Caribaea Alliance**, x= 12			
H. caribaea (type)			
H. pedalis (as senegambica)	48	50,68	Sharma & Bal, 1956
2. **Littoralis Alliance**, x= 22, 23			
H. littoralis (type)	46		Sato, 1938
	44	11,46	Sharma & Bal, 1956
3. **Caroliniana Alliance**, x= 20, 22, 26			
H. caroliniana (type)			
H. galvestonensis	52		Flory, 1939
H. rotata	40		Nagao et al, 1932
	44		Sharma & Bal, 1956
(as **H. lacera** ***)	69	46	Sato, 1938
4. **Henryae Alliance**, x= ?			
H. henryae (type)			
5. **Mexicana Alliance**, x= 22			
H. mexicana (type) (as **H. concinna**)	?	54,58,76,88	Sharma & Bal, 1956
H. harrisiana	44	22 + f, 30, 76, 88, 92	Sharma & Bal, 1956
6. **Speciosa Alliance**, x= 23			
H. speciosa (type)	46		Sato, 1938
(as Pancratium speciosum)	46		Inariyama, 1937
H. macrostephana	46	92	Snoad, 1955
Subgenus 2. **Pseudostenomesson**, x= ?			
H. morrisonii (type)			
Subgenus 3. **Elisena**, x= 23			
H. longipetala (type)	46		Snoad, 1952
Subgenus 4. **Ismene**, x= 12, 23, 37			
H. quitoensis (as **Leptochiton**)	24		Snoad, 1952
H. amancaes	46		Snoad, 1955
H. narcissiflora (as **H. calathina**)	74	24,49,62,63, 64,76,77...	Mookerjea, 1955
		86—23(?).	Snoad, 1955
H. x spofforthiae			
clone 'Sulphur Queen'	74	37,59,63...	Mookerjea, 1955
clone 'Daphne'	44	42,54,59,.. 66,72,98...	Sharma & Bal, 1956

* The basic number for the entire genus is x=12.
** Secondary basic numbers due to further evolution within the genus.
*** The nomenclature of this entry is in doubt.

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Acknowledgements.—The writer has carried on research on the **Amaryllidaceae** at the San Diego Museum of Natural History since 1954, and wishes to express his gratitude for many courtesies extended by Dr. George E. Lindsay, Director, Dr. Reid Moran, Curator, of the Herbarium, and Mrs. Mildred H. Meeder, the Librarian. Thanks are also due to Dr. Lloyd H. Shinners, Director, Herbarium, Southern Methodist University, Dallas, Texas; Dr. B. B. Ward, Curator, Herbarium, Florida Agr. Expt. Sta., Gainesville, Fla., and Miss Caroline Dormon, Saline, Louisiana, for the donation of **Hymenocallis** specimens. Acknowledgements of assistance from Mrs. Mary G. Henry and others appear elsewhere in this paper. Thanks are also due Wyndham Hayward and C. L. Burlingham for plants furnished.

KEY TO THE SUBGENERA, ALLIANCES AND SPECIES OF THE GENUS **HYMENOCALLIS**

Abbreviations: leaves—**lvs;** flowered—**fld;** tepaltube—**tube;** telpalsegs—**segs;** staminal cup—**cup;** filaments—**fils.**

1a. Stamens more or less straight:
2a. Flowers not pendulous:
3a. Cup not deflexed:

Subgenus I. **HYMENOCALLIS**

4a. Lvs sessile; never with well-developed petiole; at most sub-petiolate in Mexicana Alliance, below, and then usually variable on the same plant:

5a. Leaves **not** narrowly or broadly elliptic, or broadly oblanceolate, or sub-petiolate:

6a. Anthers extrorse, versatile; lvs usually evergreen, rarely deciduous; suboblong, or broad oblong-sword-shaped or oblong oblanceolate or sword-shaped; apex acute or obtuse or rounded; tapering downwards below the middle to the lorate basal part; 2—10.6 cm. wide at the greatest width:

7a. Segs not shortly adnate to the base of the cup; lvs 3.5—10.6 cm. wide . . .. I. **CARIBAEA ALLIANCE**

8a. Lvs rounded at the apex: Lvs 4—5.5 cm. wide; 4—13-fld; tube (4.5)—6.5—9 cm. long; segs 8—11 cm. long; cup 3—3.5 cm. long; fils (3.5—4)—4.5—6 cm. long; ovules 2 per cell (W. I.) . . .. 1. **arenicola**

8b. Lvs acute or obtuse at the apex:

9a. Tube 4.5—6.5 cm. long: Lvs 5—7.5—(10) cm. wide; 8—10- or more fld; segs (8)—9—11—(12) cm. long; cup funnel-shaped, margins erect, 2—3 cm. long; 2 ovules per cell (W. I.) .... 2. **caribaea**

9b. Tube 8—22 cm. long:

10a. Tube as long as or shorter than the segs; **except** 12b **H. expansa** var **dominicensis:**

11a. Ovules 6, sometimes 4—5 per cell; fils 6—6.8 cm. long: Lvs 6—10.6 cm. wide; 8—(12?)-fld; tube 8.7—12.2 cm. long; segs 11.2—12 cm. long; cup funnel-shaped, narrow, tubulose below, 2—2.5 cm. long; Oct.—Nov.—Dec. — flowering (w. Fla.) . . .. 3. **kimballiae**

11b. Ovules 2, rarely 3, per cell . . .. 4. **expansa**

12a. Fils 4.5—6 cm. long; 10—20-fld: Lvs 3.8—7.5 cm. wide; tube 8—10.6 cm. long; segs 9—14.5 cm. long; cup 2.5—3.5 cm. long, tubulose below, funnel-shaped above, margins erect (W. I.) . . 4a. **expansa** var. **expansa**

12b. Fils 3—3.3 cm. long; 3-fld: Tube 9—10 cm. long; segs 7—7.5 cm. long; cup 2.2—2.3 cm. long (W. I.—Dominica) . . . . 4b. **expansa** var. **dominicensis**

10b. Tube longer than the segs **(see also 12b, above)**:

13a. Cup less than 2 cm. long:
Lvs 5.5—6.4 cm. wide; 9—16-fld; tube 10—14 cm. long; segs very narrow 8—11 cm. long; fils 4.5—5 cm. long; ovules 4, sometimes 3 or 5 per cell; (Guat.) . . 5. **tenuiflora**

13b. Cup more than 2 cm. long:

14a. Tube 10—15 cm. long; ovules 2 per cell: Lvs 4.5—10 cm. long; 6—10 fld; segs 9—14 cm. long; cup funnel-shaped, margins spreading, 2—3 cm. long; fils 4—6 cm. long (Fla. and W. I.) . . . . 6. **latifolia**

14b. Tube 14.5—22.5 cm. long; ovules 4—6 per cell:
Lvs. 3.5—7.5 cm. wide; 5—14-or more -fld; segs 10—15 cm. long; cup 2.5—3.5 cm. long; fils 5—6 cm. long . . . . 7. **pedalis**

15a. Leaves not variegated (So. Amer) . 7a. **pedalis** var. **pedalis**

15b. Leaves variegated (cult.) . . . . 7b. **pedalis** var. **variegata**

7b. Segs shortly adnate to the base of the cup; lvs 1.4—7.4 cm. wide . II. **LITTORALIS ALLIANCE**

16a. Tube 17.5—20 cm. long, or 14—17 cm. long:
Lvs 2—3.8 cm. wide; 5—11-fld; segs 7.5—8—9—11, rarely 12—12.5 cm. long; cup funnel-shaped, margins wide-spreading-rotate, 2—3—3.5 cm. long; fils 4—6 cm. long; ovules 4—5, sometimes 8, per cell (Colombia, Guiana and Mexico) . 8. **littoralis**

16b. Tube 7.5—14.8-fld:

17a. Sept.-Oct.flowering species:

18a. Leaves lighter green (yellowish-green):
Lvs narrowly to broadly lorate-lanceolate, apex acute, 40—61 cm. long, 2.7—7.4 cm. wide; or oblanceolate, apex bluntly acute, 41—60 cm. long, 5—5.5 cm. wide; 6—9-fld; tube 9.8—14.8 cm. long; segs 9.5—11.8 cm. long; cup 2.5—3.3 cm. long; fils 4.5—5.8 cm. long; ovules 5—6 per cell (Mexico—State of Vera Cruz).....9. **dryandri**

18b. Leaves deeper green:

19a. Lvs lorate-lanceolate, narrowing below, acute, 43—73 cm. long, 2.5—4 cm. wide; 9-fld; tube 12.2—13.5 cm. long; segs 10.5—10.8 cm. long; cup 2.7—3.5 cm. long; fils 5.5—5.6 cm. long; ovules 5—7, sometimes 4 or 8—10 per cell; (west Africa) . . ..10. **senegambica**

19b. Lvs linear-lorate, acute, 30—62 cm. long; 1.4—2.1 cm. wide; 3—6-fld; tube 7.5—12 cm. long; segs 8.5—12 cm. long; cup 2.3—3.5—(4?) cm. long; fils 4—6 cm. long; ovules 4—6, sometimes 8, per cell (Mexico) . . ..11. **acutifolia**

17b. June—July flowering species:
Lvs linear-lorate, with translucent margin; 37—56 cm. long; 1.9 cm. wide; 4—7-fld; tube 10—12 cm. long; segs 10.8—11 cm. long; cup 2.6 cm. long; fils 5—5.2 cm. long; ovules 4 per locule (Mexico) . . ..12. **riparia**

6b. Anthers introrse, ± erect at anthesis, not versatile. Lvs deciduous, linear or linear-lorate to broadly lorate, or ensiform, or oblanceolate, shortly narrowed to the obtuse apex, slightly tapered to the base, or tapered below the middle and noticeably narrowed in lower part, or rarely long-oblong, biflabellately arranged; (0.8)-1.3-4.6 cm. wide at the greatest width:

20a. Ovary globose, rarely somewhat oblongish; ovules 1—2, rarely 3 (in one sp. 4—5) per cell:

III. **CAROLINIANA ALLIANCE**

21a. May-June-July flowering species:

22a. Fils 1.3—1.4 cm. long; tube 4.5—5.5 cm. long:
Lvs 1.3—1.7 cm. wide; 5—7-fld; segs 7—8 cm. long; cup

4—4.5 cm. long; fils 1.3—1.4 cm. long; ovules 2 per cell (Alabama) See A. H. Howell, 1913, specimens (BM,K) . . .. 13. **sp.**

22b. Fils 1.8—3.5 cm. long; tube 5—12 cm. long:

23a. Cup funnel-shaped, 5.5 cm. long; May flowering: Lvs 2.3—2.8 cm. wide; 4-fld; tube 8—8.2 cm. long; segs 9.6—10.5 cm. long; fils 2.1 cm. long; ovules 2 per cell (Georgia .... 14. **coronaria**

23b. Cup 2—4 cm. long:

24a. Umbel 2— or more-fld; June-July flowering; spathe functional:

25a. Fils 1.8—1.9 cm. long: Lvs 1.3—1.5 cm. wide; 4—7-fid; tube 5—7 cm. long; segs 6.5—7.5—8—9 cm. long; cup (2)-2.5—3.5 cm. long; ovules 2 per cell (Texas, Louisiana, Oklahoma, and Arkansas) . . .. 15. **galvestonensis**

25b. Fils 2.3—3.5 cm. long:

26a. Scape 39—54 cm. tall: Lvs 1.8—4.2 cm. wide; 4—9-fld, rarely 3-fld on young bulbs attached to mother bulbs; tube (5.2—6.2)—6.7—12 cm. long; segs (5—7) 7.4 — 10.3 cm. long; cup 3.3—4 cm. long; fils 2.3—3.5 cm. long; ovules 2, rarely 1 per cell (s. e. USA, Georgia and Kentucky westward to so. Missouri, Arkansas and Louisiana) . . .. 16. **caroliniana**

26b. Scape 22—30 cm. tall:

27a. Umbel 2-fld; lvs **not** long-oblong, 16—19.7 cm. long, 1.7—2 cm. wide; 2-fld; tube 8—9.3 cm. long; segs 9.2—9.4 cm. long; cup 3.1—3.3 cm. long; fils 2.4—2.9 cm. long (Georgia and South Carolina) . . ... 17. **rotata**

27b. Umbel 4—6-fld; lvs long-oblong, bifiabellately arranged, 22 cm. long, 3.7 cm. wide; tube (5.4)

—8—8.2 cm. long; segs 10.2—10.5 cm. long; cup 3.1—3.2 cm. long; fils 2.4 cm. long; ovules 2—3 per cell (w. Florida). 18. **choctawensis**

24b. Umbel 1-fld; spathe non-functional; Lvs 1.5—1.6 cm. wide; tube 6 cm. long; segs 6.5 cm. long; cup 2.7 cm. long; fils 3.1 cm. long; ovules 2 per cell (South Carolina) . . . . .19. **pymaea**

21b. Late July-August and later flowering species:

28a. Ovules 2, rarely 1 or 3, per cell; segs 0.7—1.3 cm. wide:

29a. Fils 2.6 — 3.1 — 3.7 cm. long; cup 3.1—3.8 cm. long; segs 0.7—1 cm. wide:
Lvs 2.3—3.2 cm. wide; 6—9-fld, sometimes 3—5-fld; tube 8.2—11.8 cm. long; segs 8.1—10.7 cm. long; ovules 1—2, rarely 3, per cell; Aug.-flowering (Texas and Louisiana). . 20. **eulae**

29b. Fils 4.2—5 cm. long; cup 3.8—4.2 cm. long; segs 0.8—1.3 cm. wide:
Lvs 4—4.2 cm. wide; 7—8-fld; tube 9.3—10.5 cm. long; segs 11.5—14 cm. long; ovules 2—3 per cell; late July-Aug. flowering (Georgia) . . . . .21. **moldenkiana**

28b. Ovules 4—5 per cell; segs 0.5—0.7 cm. wide:
Lvs 2.1—2.4 cm. wide; 5-fld; tube 8.6 cm. long; segs 8.6—9.1 cm. long; cup funnel-shaped, margins not incised, 3.3—3.5 cm. long; fils 2.9 cm. long; (North Carolina) . . . . .22. **palusvirensis**

20b. Ovary oblong or somewhat pyriform; (1.4)—1.8—2.5 cm. long; ovules 6—9, rarely 3—5, per cell:

IV. **HENRYAE ALLIANCE**

29a. Umbel 4—7-fld:
Lvs (0.7)-1.1—1.8—2.8 cm. wide; tube 7—11—12.8 cm. long; segs 6.5—8.5—9 cm. long; cup 2—2.5 cm. long; fils 3—3.5 cm. long; ovules 4—5, sometimes 8, per cell (Cuba—Santa Clara Province) . . . . . .23. **praticola**

29b. Umbel usually 1—3-fld, rarely up to 4-fld:

30a. Cup 4.5—5.2 cm. long; umbel 2-fld, sometimes 3—4-fld under cult.:
Lvs 1.3—2.6 cm. wide; tube

7.7—9 cm. long; segs 8.7—10.2 cm. long; fils 2.2—3.1 cm. long; ovules 6, rarely 4—5 per cell (peninsular Florida) . . . . 24. **floridana**

30b. Cup 1.6—3.8 cm. long; umbel 1—3-fld:

31a. Umbel 3-fld:

32a. Cup 3.4 cm. long, subrotate above, shortly tubulose below:
Lvs 1.2—1.7 cm. wide; tube 9.5 cm. long; segs 9.6—10.6 cm. long; fils 3.1 cm. long; ovules 7—8 per cell; late July-flowering (w. Florida) . 25. **henryae**

nel-shaped, margins erect.
32b. Cup 2.2 cm. long, fun-
Lvs 2.1—3.1 cm. wide; tube 7.5—8.2 cm. long; segs 9.8 10.8 cm. long; fils 3.1—4 cm. long; ovules 8 per cell; late Aug.-Sept. flowering (s. peninsular Florida) . . 26. **puntagordensis**

31b. Umbel 1-fld:

33a. Lvs 5—7—8—10 mm wide; spathe non-functional: tube (6.4)—9—9.4 cm. long; segs 8.5—11.5 cm. long; cup 3—3.8 cm. long; fils 2.6—3.4 cm. long; ovules 8—9, 3—4 in depauperate plants (peninsular Florida) . . . . 27. **palmeri**

33b. Lvs 4 mm wide; tube 3—3.5 cm. long; segs 5 cm. long; cup 1.6—1.7 cm. long; fils 2—2.5 cm. long; ovary oblong (number of ovules per cell unknown) (e. coastal Florida) . . . . . 28. **humilis**

5b. Lvs deciduous, sub-linear bluntly acute, or broadly-elliptic, shortly acuminate, cuneate at the base, or elliptic-lorate, obtuse, or oblanceolate, bluntly acute, or suboblong, apex obtuse, or oblong-elliptic, or oblong-ensiform, acute; tapering to a sub-petiolate base; (subpetiolate leaves are not constant and may be produced on the same plant with other types; or may appear in different years); ovules usually 2, rarely 3, per cell:
IV. **MEXICANA ALLIANCE**

34a. Lvs **not** sub-linear; or linear lanceolate:

35a. Tube straight, usually 10—15 cm., rarely 5 cm. long:

36a. Cup 2.5—3 cm. long:

37a. Cup funnel-shaped, 2.7—3 cm. long; Lvs 7.5—9 cm. wide; 4—5-fld; tube 10 cm. long; segs 6.5—7.5 cm. long; fils 2.5—3 cm. long (Mexico) 29. **eucharidifolia**

37b. Cup rotate from a tubulose base:

38a. Leaves broad-elliptic or elliptic-lorate; cup 2.7—3 cm. long . . . . 30. **choretis**

39a. Lvs 6.2—8 cm. wide; 2—4-fld; tube 14—15 cm. long; segs 7—9 cm. long; fils 2.5—3.5 cm. long (Mexico) . . . . 30a. **choretis** var. **choretis**

39b. Tube 5 cm. long; segs subequaling it in length (Mexico—Oaxaca) . . . . 30b. **choretis** var. **oahacensis**

38b. Lvs oblanceolate, bluntly acute or bluntly and widely cuspidate, long tapered downward; cup 2.5 cm. long: 1—4-fld; tube 11.5—14 cm. long; segs 8 cm. long, fils 3 cm. long (Mexico) . . . . 31. **horsmannii**

36b. Cup 1.3—1.8 cm. long: Lvs 3—5.1 cm. wide; 1—6-fld; tube funnel-shaped, margins spreading, 10—13 cm. long; segs 6—7.5 cm. long; fils 2.5—3.5 cm. long (Mexico) . . . . . 32. **harrisiana**

35b. Tube curved, 3.5—5 cm. long: Lvs 2—3.7 cm. wide (4.6 cm. wide in cult.); 2—8-fld; segs 5.5—6.7 cm. long; cup funnel-shaped, 1.5—2 cm. long; fils 2—3 cm. long (Mexico) . . . . 33. **mexicana**

34b. Leaves sub-linear (almost linear); or linear-lanceolate:

40a. Tube 10 cm. long; lvs 6—12 cm. wide; 3—4-fld; segs 6.5—8 cm. long; cup 2 cm. long; fils 3 cm. long (Mexico—Sonora) . . . . 34. **sonorensis**

40b. Tube 3.5—4 cm. long; lvs 6—8 cm. wide; 1—4-fld; segs 6.5—7 cm. long; cup 3—3.2 cm. long; fils 2 cm. long (Mexico—Morelos)) . . . . 35. **graminifolia**

4b. Lvs with a well-developed petiole; ovules 1 or 2 per cell:

V. **SPECIOSA ALLIANCE**

41a. Leaf-blades broad elliptic or broad-oblong-elliptic, wedge-shaped at the base:

42a. Tube 12.5—20 cm. long (n. So. Amer. & Trinidad) . . . . 36. **tubiflora**

42b. Tube 3—5.5 cm. long or 9.5—10 cm. long:

43a. Cup deeply cleft between the fils, often almost to the base (Brasil ?) . . . . 37. **schizostephana**

43b. Cup toothed but not cleft downwards:

44a. Leaf blades very broad-elliptic, about twice as long as broad, 10.5—30 cm. long; 4—15 cm. wide:

45a. Tube 3—5.5 cm. long; fils 3.5—4 cm. long; leaf-blades 15.5—30 cm. long, 7.5—15 cm. wide (W. I.) ....38. **ovata**

45b. Tube 5—7 cm. long; fils 2.8—3 cm. long:

46a. Leaf-blades 10.5 cm. long; 4 cm. wide (W. I.)......38a. **ovata** var. **ovalifolia**

46b. Leaf-blades 18—23 cm. long, 7.5—12.5 cm. wide (Guat.) . . ..38b. **ovata** var. **ornata**

44b. Leaf-blades elliptic or oblong-elliptic, three to five times as long as broad, 26—65.5 cm. long, 6.3—15.5 cm. wide:

47a. Leaf-blades 32—33 cm. long, 6.3—8 cm. wide; petioles 6—7 cm. long (W. I.—Barbados) . . . 39. **fragrans**

47b. Leaf-blades 26 — 65.5 cm. long, 8—15.5 cm. wide; petioles 9—30 cm. long (W. I. and Mexico) . . ..40. **speciosa**

41b. Leaf-blades ovate, cordate at the base (Mexico) . ...41. **cordifolia**

3b. Cup at first straight, but finally permanently deflexed at right angles with the tube and ovary:

Subgenus II. **ELISENA** (Herb.) McBride

48a. Segs 10 cm. long:

49a. Stamens criss-cross: hybrid—**H. narcissiflora** x **H. longipetala** .....42. **x festalis**

49b. All stamens straight (Peru and Ecuador) . . ..43. **longipetala**

48b. Segs 3.8—5 cm. long; fils 1.3—3.2 cm. long:

50a. Tube 2 cm. long (Peru).........44. **ringens**

50b. Tube under 1.3 cm. long:

51a. Pedicels 6 mm long; segs 7.4 cm. long; fils 5.2 cm. long (Peru) . . ..45. **velardei**

51b. Pedicels 1.3—2 cm. long; segs 5 cm. long; fils 1.3 cm. long (Peru) . . ..46. **sublimis**

2b. Flowers pendulous; relatively small:

Subgenus III. **PSEUDOSTENOMESSON** (Velarde) Traub

52a. Flowers whitish-green . . ..47. **morrisonii**

52b. Flowers green . . ..48. **vargasii**

1b. Stamens incurved:

Subgenus IV. **ISMENE** (Salisb.) Baker ex Traub

53a. Umbel 1-flowered; leaves sessile, deciduous . . . . Section 1. **Quitoensae**

Ovules 18—20 per cell, (Ecuador) . . . . . . 49. **quitoensis**

53b. Umbel more than 1-fld; leaves attached to an aerial deciduous pseudostem; ovules 2—6 per cell . . . . Section 2. **Narcissiflorae**

54a. Tube greenish-yellow, rest of flower yellow or sulfur-colored:

55a. Flowers yellow (Peru) . . . . 50. **amancaes**

56a. Cup not cleft into lobes; scent agreeable (Peru) . . . . 50a. **amancaes** var. **amancaes**

56b. Cup cleft into lobes, scent unpleasant (Peru) . . . . 50b. **amancaes** var. **foetida**

55b. Flowers sulfur-colored: hybrid—**H. narcissiflora** x **H. Amancaes** . . . . 51. **x spofforthiae**

54b. Flowers white or greenish-white:

57a. Tube straight:

58a. Tube 7.6—10 cm. long:

59a. Pedicels very short; fils arcuate-incurved, 2.5 cm. long; hybrid—**H. speciosa** x **H. narcissiflora**. . . . 52. **x macrostephana**

59b. Ovary sessile; fils abruptly incurved, 1.3 cm. long (Peru and Bolivia) . . . . 53. **narcissiflora**

58b. Tube 3.8—5 cm. long: Ovary sessile or flowers pedicellate; fils 1.3 cm. long (Peru). . . . 54. **macleana**

57b. Tube curved:

60a. Segs 7.6—10 cm. long; flowers white (Peru) . . . . 55. **deflexa**

60b. Segs 5 cm. long; tube green, segs white (Andes) . . . . 56. **nutans**

Descr. ampl. et spp. nov.

Cited specimens greenhouse grown at Beltsville, Md., are marked with an asterisk (*); those greenhouse grown at Arcadia, Calif., are marked with two asterisks (**); and those grown outdoors, La Jolla, Calif., are marked with three asterisks (***). Cited specimens not so marked were collected in the wild.

3. **Hymenocallis kimballiae** Small ex Traub, plant Life **14:** 44-46. 1958. Syn.- **H. kimballiae** Small, S. E. Flora, 323, 1053, 1933, **nom. subnudum.** Specimen: **Traub ***523a+b** (TRA), Estuary, Appalachicola River, west Florida; from bulbs collected by Mrs. Kimball, via Mrs. Mary G. Henry.

9. **Hymenocallis dryandri** (Ker.-Gawl.) Sweet, Hort. Brit. ed. 2. p. 513. 1830. Syn.- **Pancratium dryandri** Ker-Gawl. Genus Pancratium (Quart. J. Sc. & Arts **3:** 326) 11. (1817). Specimens: **Traub ***893a+b+c; ***894a+b; ***701a+b; ***657a+b; ***658a+b** (TRA); from bulbs collected by Otto Nagel in 1955, on or near the shore of Lago de Catemaco, State of Vera Cruz, Mex. r'c'd via Mrs. Morris Clint.

10. **Hymenocallis senegambica** Kunth & Bouché, In. Sem. Hort. Berol. 1848, p. 12, pro parte. Kunth, Enum. Pl. 5: 676. 1850, pro parte. Specimens: **Traub ***591a+b** (cult.); *****662a+b** (cult.) *****663a+b** (cult.) (TRA). All r'c'd from cultivation.

12. **Hymenocallis riparia** Greenm., in Proc. Am. Acad. **41:** 235. 1906. Specimens: **Traub ***895; ***696a+b,** from bulbs collected by Mrs. Morris Clint, State of Michoacan, Mex.

14. **Hymenocallis coronaria** (Le Conte) Kunth, **descr. ampl.** Enum. Pl. **5:** 855. 1850. Syn- **Pancratium coronarium** Le Conte, in Ann. Lyceum Nat. Hist. New York **3:** 145, t. 4, figs. 7—9. 1836. Specimens: **Traub *284a+b+c; *285** (TRA), from bulbs collected by Scott on Savannah River, in Georgia, r'c'd via Dr. Flory.

Foliis anguste oblanceolatis 35—56 cm. longis, 2.3—2.8 cm. latis; scapo 38 cm. longo; spatha lanceolata 6 cm. longa; umbella 4-flora; floribus albis; ovario sessili globoso 1.2 cm. longo; ovulis in quoque loculo 3; tubo tepalorum 8—8.2 cm. longo; segmentis tepalorum 9.6—10.5 cm. longis; poculo staminorum infundibulariformi 5.5 cm. longo; filamentis 2.1 cm. longis; antheris introrsis.

15. **Hymenocallis galvestonensis** (Herb.) Baker, Amaryll. 126. 1888. Syn- **Choretis galvestonensis** Herb., Amaryll. 221, pl. 11, figs. 34,35. 1837; **Hymenocallis liriosme** Raf. ex Shinners, Field & Lab. 19: 102—103. 1951. Specimens: Traub ****286,** Houma, La. (TRA); Caroline Dormon **882,** Prairiveville, La. (TRA); **884,** Lake, La. (TRA); Whitehouse **12,144,** Wharton Co., Tex. (SMU); V. L. Cory **56,020,** Red River Co., Tex. (SMU); Fred B. Jones, **1189,** Regugio Co., Tex. (SMU); L. H. Shinners, **19,442,** Austin Co., Tex. (SMU); John H. Loring, **70,** McCurtain Co., Okla. (SMU); Delzie Demaree, **24,343,** Drew Co., Ark. (SMU).

16. **Hymenocallis caroliniana** (L.) Herb., **descr. ampl.** Herbert, App. 44. 1821; Sweet, Hort. Brit. ed. 2. p. 513. 1830. Syn- **Pancratium carolinianum** L. Sp. Pl. **1:** 291. 1753; Miller, Gard. Dict. ed. 8, no. 6. 1768; Walter, Fl. Carol. 120. 1788; Ker(-Gawl). Rev. Genus Pancratium, 4 (Quart. J. Sc. & Arts, **3:** 319). 1817, quoad syn.; **Pancratium maritimum** L. sec. Purch, Fl. Amer. Septentr. **1:** 222. 1814; Elliott, Sketch Bot. South-Carolina & Georgia, **1:** 383. 1817; **non** L.; **Pancratium occidentale** Le Conte, in Am. Lyceum Nat. Hist. New York, **3:** 146. 1836. **Hymenocallis occidentalis** (Le Conte) Kunth, Enum. Pl. 5: 856. 1850.

Foliis 6—12 anguste oblanceolatis usque oblanceolatis infra angustatis raro elliptico-loratis obtuse acutis 25—43 cm. longis, 1.8—4 cm. latis; scapo 34—54 cm. alto; spatha lineari-lanceolata usque lanceolata acuta vel obtuse acuta vel subtruncate acuta 3.7—6 cm. longa; umbella 3—9 flora; floribus suavaviter fragrantibus; tubo tepalorum pallide subviridi, cetero floris albo; ovario sessili globoso; ovulis in quoque loculo 2 raro 1; tubo tepalorum 5.8—10 cm. longo; segmentis tepalorum 7.4—10 cm. longis; poculo staminorum 3.3—4 cm. longo superne infundibulariformi usque cupuliformi, inferne brevitubuloso, marginibus inter filamenta irregulariter incisis; filamentis 2.3—3.5 cm. longis; antheris introrsis erectis; granulis pollinis flavis; stylo stamina excedenti; stigmate minuto.

Specimens:—GEORGIA: Bibb County, near Stratton Sta., **Traub *264; *265a+b+c** (TRA). ALABAMA: Conecuh County, s. w. Evergeen, **Traub *238a+b+c; *241; *243** (TRA); Butler County, n. McKenzie, **Traub *257, *258a+b, *259, *260** (TRA). MISSISSIPPI: Tunica County, n. Clarksdale, **Traub *273, *274, *275a+b, *277** (TRA). LOUISIANA: Avoyelles Parish, near Bunkie, Caroline Dormon, **883** (TRA). KENTUCKY: Mammoth Cave, **Traub *244a+b** (TRA). INDIANA: Spencer County, s.e. of Hatfield, **Traub *233, *234a+b+c** (TRA). All from bulbs collected by Mrs. Mary G. Henry, except the Caroline Dormon specimen.

17. **Hymenocallis rotata** (Ker-Gawl.) Herb. **descr. ampl.** Herb. App. 44. 1821; Amaryll. 217. 1837. Syn- **Pancratium rotatum** Ker-Gawl., in Bot. Mag. Lond. pl. 827. 1805; Genus Pancratium (in Quart. J. Sc. & Arts **3:** 327) 12. 1817; **Pancratium mexicanum** Le Conte, in Ann. Lyceum Nat. Hist. New York **3:** 143, pl. 4, figs. 1—3. 1836, **non** L.; **Pancratium rotatum** var. **biflorum** Ker-Gawl., in Bot. Mag. Lond. pl. 1082. 1808. Specimens: Traub ***250a+b,** Marion Co., S. C.; ***281,** Baxley, Ga. (TRA); all from bulbs collected by Mrs. Mary G. Henry.

Foliis lanceolatis usque oblanceolatis 16—30 cm. longis, 1.7—2 cm. latis; scapo 27—30 cm. longo; spatha lanceolata 2.5—3.2 cm. longa; umbella biflora interdum in statu culto 3—4-flora; floribus albis; ovario sessili globoso 1—1.4 cm. longo; ovulis in quoque loculo 2 vel 3; tubo tepalorum 8—9.3 cm. longo; segmentis tepalorum 9.2—9.4 cm. longis; poculo staminorum rotato 3.1—3.3 cm. longo; filamentis 2.4—2.9 cm. longis; antheris introrsis.

18. **Hymenocallis choctawensis** Traub, **sp. nov.**

Specimens: Traub ***262; 263a+b,** holotype (TRA), Walton Co., Fla. From bulbs collected by Mrs. Mary G. Henry.

Foliis loratis 24 cm. longis, 3.7 cm. latis, biflabellatis; scapo 22 cm. longo; spatha 3.6 cm. longa; umbella 4—6-flora; ovario sessili globoso 1.2 cm. longo; ovulis in quoque loculo 2 vel 3; tubo teparlorum 5.2—8.2 cm. longo; segmentis tepalorum 9.2—10.3 cm. longis; poculo staminorum rotato 3.1—3.2 cm. longo; filamentis 2.7—3.2 cm. longis; antheris introrsis.

19. **Hymenocallis pygmaea** Traub, **sp. nov.**

Foliis elliptico-oblanceolatis usque anguste oblanceolatis 15—22 cm. longis, 1.5—1.6 cm. latis, apice obtuse acutis; scapo 14.7 cm. longo; spatha bivalvata 2.3 cm. longa rudimentaria inutili; umbella uniflora; flora recto; paulo fragranti; tubo tepalorum parteque superiore tertia styli viridibus, cetero floris albo; ovario sessili globoso, ovulis in quoque loculo 2; tubo tepalorum 6 cm. longo; segmentis tepalorum 6.5 cm. longis; poculo staminorum 2.7 cm. longo, superne rotato, inferne brevitubuloso; filamentis 2 cm. longis; antheris introrsis 1.2 cm. longis; granulis pollinis flavis.

Specimen: Traub ***279**, holotype (TRA), Horry Co., S. C. From bulbs collected by Mrs. Mary G. Henry.

20. **Hymenocallis eulae** Shinners, **descr. ampl.**
Shinners, Field & Lab. 19: 103. 1951.

Specimens: Whitehouse, **16,448** (holotype), cult. van Zandt Co., Tex. (SMU & TRA); Traub ***268a+b**, Clarksville, Tex. (TRA); grown from bulbs collected by Mrs. Mary G. Henry; *****876a+b**, Ringold, La. (TRA), from bulbs collected by Caroline Dormon; Caroline Dormon **886**, Castor, La. (TRA).

Foliis deciduis oblanceolatis 18—33 cm. longis, 2.3—3.2 cm. latis; scapo in Augusto-Septembri emergenti 64—75 cm. longo; spatha lanceolata 3.2—4 cm. longa; umbella (3—)6—9-flora; floribus albis fragrantibus; ovario sessili globoso 1.1 cm. longo; ovulis in quoque loculo 1 vel 2, raro 3; tubo tepalorum 8.2—12 cm. longo, segmentis 8.2—10.8 cm. longis; poculo staminorum 3.1—3.4 cm. longo; filamentis 3.1—3.8 cm. longis; antheris introrsis.

21. **Hymenocallis moldenkiana** Traub, **sp. nov.**

Specimens: Traub ***271a+b; *272a+b**, holotype, (TRA), Appling Co., Ga.; from bulbs collected by Mrs. Mary G. Henry.

Foliis 14—17 oblanceolatis 42—45 cm. longis, 3.8—4.2 cm. latis, usque ad basin angustatis, apice obtuse acutis; scapo 56 cm. longo; spatha 2-valvata lanceolata acuta 5—5.5 cm. longa; umbella 7—8-flora, floribus 6 ab initio eadem tempestate florentibus albis fragrantibus; ovario sessili globoso 1.1—1.4 cm. longo, 0.8—1cm. diametro; ovulis in quoque loculo 2 vel 3; tubo tepalorum 9.3—10.5 cm. longo, 6—7 mm. diametro, segmentis lanceolatis; segmentis setepalorum 12—14 cm. longis, 0.8—1 cm. latis, segmentis petepalorum 11.5—13 cm. longis, 1.1—1.3 cm. latis; poculo staminorum lato superne infundibulariformi, inferne brevitubuloso, 3.8—4.2 cm. longo, margine irregulariter inciso; filamentis 4.2—5 cm. longis. Named in honor of the well-known plant scientist, Dr. Harold N. Moldenke.

22. **Hymenocallis palusvirensis** Traub, **sp. nov.**

Specimens: ***251a+b+c**, holotype (TRA), Brunswick Co., N. C., from bulbs collected by Mrs. Mary G. Henry.

Foliis lineari-lanceolatis 38—47 cm. longis, 2.1—2.4 cm. latis; scapo 40 cm. longo; spatha lanceolata 3.8 cm. longa; umbella 5-flora; floribus albis; ovario sessili globoso 1.1 cm. longo; ovulis in quoque loculo 5; tubo tepalorum 8.6 cm. longo; segmentis tepalorum 8.6—9.1 cm. longis; poculo staminorum infundibulariformi 3.3—3.5 cm. longo; filamentis 2.9 cm. longis; antheris introrsis.

23. **Hymenocallis praticola** Britton & Wilson, in Mem. Torr. Bot. Club **16:** 60. 1920. Specimen: J. G. Jack, **1,555,736** (US), Cuba, Santa Clara Prov.

24. **Hymenocallis floridana** (Raf.) Morton **descr. ampl.**
in Yearbook Amer. Amaryllis Soc. (Herbertia) **2:** 81. 1935. Syn- **Pancratium rotatum** Le Conte, in Ann. Lyceum Nat. Hist. New York **3:** 144, pl. 4, figs 4—6. 1836, **non** Ker-Gawl.; **Tomodon floridanum** Raf., Fl. Tellur. **4:** 22. 1838.

Foliis anguste oblanceolatis 35—36 cm. longis, 2—2.6 cm. latis; scapo 27 cm. longo; spatha lanceolata 5.3—5.8 cm. longa; umbella biflora, interdum in statu culto 4-flora; floribus albis; ovario sessili oblongo 1.6—1.7 cm. longo; ovulis in quoque loculo 6, interdum 4 vel 5; tubo tepalorum 7.7—9 cm. longo; segmentis tepalorum 8.7—10.2 cm. longis; poculo staminorum lato, superne in fundibulariformi, inferne brevitubuloso, 4.5—5.2 cm. longo; filamentis 2.2—3.1 cm. longis; antheris introrsis.

Specimens: Traub ***278a+b+c** (TRA), Lake Jessup, Fla.; Traub ***280** (TRA), Hernando Co., Fla. All from bulbs collected by Mrs. Mary G. Henry.

25. **Hymenocallis henryae** Traub, **sp. nov.**

Foliis anguste oblanceolatis 27.5—42.5 cm. longis, 1.2—1.7 cm. latis, ad basin angustatis, apice acutis; scapo 53 cm. alto; spatha 2-valvata lanceolata 3.5—4.5 cm. longa; umbella 3-flora; floribus rectis fragrantibus; tubo tepalorum, segmentis tepalorum, stylo stigmateque viridbus; poculo staminorum filamentisque albis; ovario sessili oblongo; ovulis in quoque loculo 7 vel 8; tubo tepalorum 9.5 cm. longo; segmentis tepalorum 9.6—10.6 cm. longis; poculo staminorum 3.4 cm. alto, superne rotato, inferne brevitubuloso; filamentis 3.1 cm. longis; antheris introrsis.

Specimen: Traub **282a+b**, holotype (TRA), Santa Rosa, Fla. From bulbs collected by Mrs. Mary G. Henry.

26. **Hymenocallis puntagordensis** Traub, **sp. nov.**

Foliis 8 lineari-loratis 28—33 cm. longis, 2.1—3.1 cm. latis, obtuse acutis; scapo 41 cm. longo; spatha lanceolata, 7.5—8 cm. longa; umbella triflora; floribus albido-subviridibus albisque fragrantibus; ovario sessili oblongo usque subpyriformi; ovulis in quoque loculo 8; tubo tepalorum 7—8.2 cm. longo; segmentis tepalorum 10—11 cm. longis; poculo staminorum infundibulariformi 2.2 cm. longo; filamentis 3.9—4.2 cm. longis; antheris introrsis; granulis flavis.

Specimen: Traub *****878a+b**, holotype (TRA), Punta Gorda, Fla. From bulbs collected by Mr. C. L. Burlingham.

27. **Hymenocallis palmeri** S. Wats., in Proc. Am. Acad. **14:** 301. 1879; Garden & Forest **1:** 139, cum ic. 1888; Traub, in Taxon **5:** 195—196. 1956. Specimens: Clara Adams & Wm. Guild **524** (TRA) St. Petersburg, Fla.; Traub ***525; *526; *527; *528** (TRA), St. Petersburg, Fla., from bulbs collected by Wm. Guild; B. B. and S. S. Ward **1607** (TRA), Collier Co. Fla.

33. **Hymenocallis mexicana** (L.) Herb. ex Druce, Dillenian Herbaria, 176. 1907. Syn- **Pancratium mexicanum** L. Sp. Pl. **1:** 290. 1753; Willd. L. Sp. Pl. 2.42. 1799; Ait. Hort. Kew **1:** 410. 1789; **Hymenocallis dillenii** Roem. Syn. Monogr. **4:** 174. 1847. Specimens: Robt. L. Dressler **261a+b** (TRA) s. e. Lagos, State of Jalisco, Mex.; Traub *****231,** *****672** (TRA), s. e. Guadalajara, State of Jalisco, Mex., from bulbs collected by Mrs. Morris Clint.

[PLANT LIFE LIBRARY, continued from page 54.]

STUDIES IN PALEOBOTANY, by H. N. Andrews. John Wiley & Sons, 440 Park Av., So., New York 16, N. Y. 1961. Illus. pp. 487. $11.75. This excellent introductory text by an outstanding authority is concerned primarily with the evolution of vascular plants on the basis of the fossil record. The presentation is occasionally reinforced with discussions on related living groups. There are also chapters on the bryophytic plants, and some paleozoic and mesozoic floras by the author; and an introduction to palynology by C. J. Felix. The illustrations are outstanding. This attractive, well-written book is very highly recommended.

DEVELOPMENTAL GENETICS AND LETHAL FACTORS, by E. Hadorn. (Trans. by Ursula Mittwoch). John Wiley & Sons, 440 Park Av., So., New York 16, N. Y. 1961. Illus. pp. 355. $8.50. The objective of this book, dealing with the pathology of development on the basis of the study of lethal factors, is to provide a synthesis between embryology and genetics. The Mendelian lethal factors are a striking illustration of the role played by the genetic material in the process of development, shedding light on the highly specific relationships between individual mutations and the processes leading to the formation of characters. In addition, since lethal factors make up a high proportion of mutations, they contribute a large body of material which needs to be incorporated into any general theory of the gene and its mutability. Highly recommended.

METABOLIC PATHWAYS IN MICROORGANISMS, by V. H. Cheldelin. John Wiley & Sons, 440 Park Av., So., New York 16, N. Y. 1961. Illus. pp. 91. $3.50. This volume deals with the pathways of carbohydrate metabolism in microbial systems, emphasizing metabolic peculiarities of acetic acid bacteria. The book also discusses the theory and techniques involved in the use of the radiorespirometer, an apparatus for distinguishing between the pentose cycle, the Krebs cycles, and the Entnor-Dondoroff pathway. There is also a general discussion of carbohydrate metabolic pathways and their importance for the overall economy of the cell, synthesis, and obtaining energy. Highly recommended.

MICROBIAL CELL WALLS, by M. R. J. Salton. John Wiley & Sons, 440 Park Av., So., New York 16, N. Y. 1961. Illus. pp. 94. $3.50. This book describes the general physical, chemical and biochemical properties of microbial cell walls which contribute the major structural components of microorganisms. Emphasis is placed on some of the unusual features of the chemical substances and structures found in bacterial cell walls, and on some of the unique biochemical processes involved in the formation of the cell walls and the manner by which antibiotics prevent the assembly of the walls. Highly recommended.

WEED CONTROL: AS A SCIENCE, by G. C. Klingman and L. J. Noordhoff. John Wiley & Sons, 440 Park Av., So., New York 16, N. Y. 1961. Illus. pp. 421. $8.50. The objective of this book is to bring together the techniques for weed control. The first part of the book is devoted to fundamentals on which weed control is based; the second part to the chemical and physical properties of various herbicides; and the third part to practical application. This is an excellent text not only for the student, but also for the practicing agriculturist and horticulturist; and others interested in weed control. Highly recommended.

INVERTEBRATE PALEONTOLOGY, by W. H. Easton. Harper & Brothers, 49 E. 33rd St., New York 16, N. Y. 1960. Illus. pp. 701. $10.00. This text by an outstanding authority was written for the professional geologist and for use in intermediate courses. It emphasizes the functional approach to invertebrate paleontology. After a condensed review of some basic concepts in biology, zoology and paleontology, the subject is presented in customary systematic order. This excellent text is highly recommended.

[PLANT LIFE LIBRARY, continued on page 129.]

3. GENETICS AND BREEDING

REPORT ON SPREKELIA BREEDING, 1961

KATHERINE L. CLINT,
2005 Palm Boulevard, Brownsville, Texas

The lack of regular and recurrent blooming of *Sprekelia formosissima* is a problem common to many of us. Although much has been written on the subject it is hoped that this report will offer a slightly different approach to the situation. That we have found success in our venture is due primarily to the kindness of friends who so generously shared their bulbs with us, for I believe that the clue lies in the behavior of different forms rather than solely in the limiting factors of climate and culture. Our experience has shown that by selective breeding of adaptable forms further improvement may be realized.

Sprekelia formosissima has an extremely wide range—from Mexico to South America—so it is understandable that many forms and variations occur within this range. Since it is known that bulbs grow under varied conditions of climate and environment in their native habitats, it is to be expected that their cultural requirements, adaptability and blooming performance will also vary. Comparatively few of these forms have found their way into cultivation and fewer still into the trade. We have secured bulbs at intervals from several commercial sources, variously listed as *Sprekelia formosissima* or *Sprekelia formosissima* var. *superba*. All of these appeared to be of the same general type which blooms sparingly or not at all for us. Dr. Traub sent us bulbs of *Sprekelia formosissima* var. *superba* which were indeed different, but they are not too happy here.

In 1952, Mrs. Chester Wheelock, of Brownsville, Texas, gave us some glaucous-leaved bulbs collected near Guadalajara, Jalisco, Mexico. These were later identified as *Sprekelia* by the collector. Deciduous, with a long dormant period, this form has steadily refused to bloom. However, growth has been phenomenal this year in tile-drained beds, so it is hoped that the increased size of the bulbs apparently needed here in the Valley will soon be reached. Larger bulbs of this same form may have been collected in early June of this year in the state of Michoacan when we were accompanied on an extensive trip through Mexico by Dr. Walter S. Flory and Dr. Raymond O. Flagg, of the University of Virginia.

In 1953, we were given a few bulbs by Fred B. Jones, of Corpus Christi, Texas, who had received them from Dr. Cesar Vargas of Peru. Much to our surprise, these bulbs not only flowered well soon after planting but gave a repeat bloom in the late fall. Moreover, they continue to flower profusely under ordinary garden care. Unlike the bulbs in the trade, leaf growth of this *Sprekelia* is neat and attractive and the flowers, though smaller, are a dark velvety red and very lovely. One may imagine that the performance of this Peruvian form gave a real boost to our interest in *Sprekelia*. Dr. Flory reports that this form is

very sulky in Virginia, where it not only refuses to bloom but remains dormant most of the year, which seems to indicate that it will not be successful everywhere.

In the fall of 1956, Len Woelfle, of Cincinnati, Ohio, sent us 3 different forms of *Sprekelia:* a small-flowered red with yellow markings, obtained from the late D. J. W. Chandler, of Australia, a large dark red and a large light red, both of the latter secured from Rex Pearce. The light red bloomed well and we found the flowers enchantingly different. In our garden the color was near pink with a sparkling glisten of gold, and the form quite unlike any we had ever seen.

In 1954, Dr. Flory reported seeing an odd little *Sprekelia* near the home of Mrs. Pedro A. Chapa, of Cuernavaca, Morelos, Mexico. Mrs. Chapa is a native of Brownsville and an old friend. She has brought us many fine plants and seeds from Mexico so when I mentioned the *Sprekelia* in 1956, she obligingly sent us a few bulbs and many seed. These bloomed well (in several distinct shades of red) in the spring of 1957 and 1958 but soon afterwards went into a decline due to poor drainage and salt seepage. They are now making a come-back in tile-drained beds and should soon recover sufficiently for their performance to be evaluated.

In January 1957, we received from Frank Harrison, of Rancho del Cielo in the mountains of the state of Tamaulipas, Mexico, two more clones of *Sprekelia.* One of these he had obtained from a nursery in Cuidad Victoria, Tamaulipas, Mexico. The other, raised from seed secured from Rex Pearce, turned out to be a real find. The flower is large and well formed, brilliant red with white stripes down the center of the segments, the amount of white varying with the season. Blooming habit equals or perhaps excels that of the Peruvian *Sprekelia.* Dr. Traub (1959) has named this form 'Harrison's Orientred'. Later, we received this same clone from Sydney Wiedermann and Dr. Thad Howard, of San Antonio, Texas, each of whom reported that the bulbs gave excellent blooming results in that city.

Early in the summer of 1957, Luciano Guerra, of Mission, Texas, brought us a quantity of bulbs collected near San Vicente, Hidalgo, Mexico. This group is interesting from many angles. Virtually evergreen, growth habit is intermediate with only a short above-ground neck. The blossoms are extremely variable in size, form and color and seem to be much more than moderately self-fertile. In the wild, very small bulbs produce two scapes, but under culture here in south Texas (as with most *Sprekelia* and many other bulbs) must attain a good size before flowering. Once this size has been reached, the San Vicente *Sprekelia* will blossom at intervals throughout the entire year.

Late in 1956, Dr. Traub had suggested that attempts should be made to cross the various forms of *Sprekelia* for a full range of color. Spring rains gave us heavy bloom during March and April of 1957 so, even though we had repeatedly failed to set seed on *Sprekelia* in the past, a number of crosses and their reciprocals were made. Much to our surprise, six large capsules ripened seed representing the following

crosses: Peruvian form x Woelfle's light red and the reciproeal; two crosses (involving different clones) of the Peruvian x 'Harrison's Orientred' and two crosses (again using different bulbs) of the reciprocal. During this same season, Frank Harrison sent us a few seeds from his 'Orientred'. He wrote that this was the first seed to form on any of his bulbs and that he was not aware whether it was a "self" or a chance cross with his "Victoria" form. We can now report that evidence is clear that the seeds came from a chance cross of the two forms.

Germination was good and in the spring of 1958 the seedlings were set a few inches or so apart in close rows in the ground under lath. We had planned to move them as they grew but space was not available so the bulbs were forced to remain in this crowded condition for three years. Very little care was given to them during this period. Despite all of these difficulties, the first few flowers appeared in the fall of 1959. Blooming continued through the winter, spring and early summer of 1960 and began again in the fall. Though very few seedlings were at that time involved and very sketchy records were kept, it began to look as if we had the start of a free-blooming hybrid race of *Sprekelia.*

Late in March of 1961, 290 of the surviving seedlings were transferred to a new raised bed. Very few had been lost but a great many were very small due to the crowding of the larger bulbs. Complete records were set up so that each seedling could be evaluated for form, color and blooming rate. Results from April 1 to August 15 have been more than gratifying. Our records show that most of the mature bulbs have already produced 3 flowers and many have given 4, which includes bulbs blooming for the first time this season. Individual flowers have been consistently good to fine and a rewarding number can be called superior. One of the biggest improvements has been a marked broadening of the segments even in the smaller blooms of the very young seedlings. Much to our disappointment, none of the offspring seem to have inherited the neat growth habit of their Peruvian parent and, so far, the near pink of Woelfle's light red has not appeared. Perhaps either or both of these characters will show up in the F_2 generation. Though hybrid vigor is apparent, the seedlings do not form offsets as freely as their parents. They seem to be about 99% to 100% self-sterile but cross readily among themselves and with any other clone. This is in contrast to their parents, which refuse to seed within their own group in this area. In fact, among the 12—15 clonal variations we are now growing, only Clint #835, the San Vicente *Sprekelia,* is self-fertile. At the same time, all will set seed when pollen from a different group is used.

Though it is too early for a complete analysis, we feel certain that a comprehensive breeding program will be most rewarding. This spring and summer our enthusiasm almost ran away with us, resulting in 18 new lots of seedlings. These include many crosses for F_2, a few crossbacks and the addition of new blood with the use of some of the finer clones of the San Vicente collection and a pert little *Sprekelia* from Ludwig which was sent to us by Claude W. Davis, of Baton Rouge,

Louisiana. Flowers of this are a light brick red, held at such an upturned angle that they are almost horizontal.

Our *Sprekelia* seedlings are still untried in other sections of the country. Considering the waywardness of the genus, it may be necessary for those who live in the north to breed their own race of hybrids, using clones which are adaptable to their area.

LYCORIS NOTES — 1960

Sam Caldwell, *Tennessee*

Lycorises are at once the most exciting and exasperating things I grow. Their habits are intriguing, since the blooms come at one time and the leaves at another. If "beauty is its own excuse for being," the flowers of most species amply justify their existence. But some of them have the annoying habit of refusing to bloom in spite of my best efforts to satisfy them.

From July till early October I trek frequently over the home grounds, peering anxiously at bare earth around label stakes to catch a first glimpse of fat "spearheads" pushing upward, promising glory to come. Sometimes they're right on schedule and delight me by showing up in profusion. Then again, certain ones may be off season, few in number or missing altogether. Newly acquired bulbs may take a fearful length of time to get established. I had one species for six years before it bloomed. Reasons for delay and failures are evident at times and at other times they are not.

The "Magic Lilies" *(L. squamigera)* I have known since childhood. The first species other than that, that I can recall planting was a "red spider-lily" bulb given me in 1927. It was of course, *L. radiata,* but at the time we thought it was *Nerine sarniensis.*

Since returning home in 1946 from World War II I have planted the different lycorises offered in the usual trade catalogs, plus a number of others secured through friendship with bulb importers. Records on these plantings have been kept through the years. Then I've learned much from reading and from talking with fellow lycoris fanciers. But I still confess an enormous ignorance of the special requirements of some of these bulbs.

Currently there seems to be a gratifying increase of interest in lycorises. Dr. Hamilton Traub has done fine work toward clearing up problems of nomenclature and identification, but among the commercial dealers there is still coufusion in these fields. We still need answers to cultural problems with some species, and I hope other growers will contribute experience reports for publication in Herbertia. The following observations and notes will serve to bring up to date certain matters on which I have reported previously in this publication.

HYBRIDIZING

To date (December, 1960) not one of my hybrid (I hope) seedling lycorises has bloomed, and my patience is wearing a little thin. First planned crosses were made in 1953, but the few seedlings resulting must

have been left too long crowded in their original pot, for they never made normal growth. Pollinations in 1954, '55 and '56, however, gave me dozens of husky young bulbs. Some of the *L. radiata* X *L. sprengeri* and the reciprocal cross bulbs I really expected to see in bloom this past year, but they disappointed me.

Probably in ground beds in a milder climate, seedling lycorises will bloom quicker—when around five years old. I still start my seeds in pots, wintered in a cold greenhouse, but now shift one- and two-year bulbs to a protected ground bed for growing on. This should speed up things.

As reported in HERBERTIA for 1958, I have both failures and apparent successes in attempting to get viable seeds by crossing various lycoris species. Since that report, several other seemingly successful cross-pollinations have been effected, so that my complete list of hybrid (?) bulbs growing along to blooming size is now as follows:

L. haywardi X **L. sanguinea** and reciprocal
L. haywardi X **L. "sperryi"** and reciprocal
L. radiata X **L. haywardi**
L. radiata X **L. sprengeri** and reciprocal
L. radiata X **L. "sperryi"**
L. sprengeri X **L. haywardi**
L. sprengeri X **L. "sperryi"**

In addition there are a few small lots of bulbs of uncertain parentage. The *L. radiata* used is a fertile strain.

Proof of actual successful hybrids, of course, will come only with their blooming. Meanwhile it seems to me that here is one of the most open fields of horticultural endeavor—especially for gardeners in the Lower South. Anyone interested in details on simple hybridizing techniques will find accounts of my own experimental work in the aforementioned 1958 HERBERTIA and in *Bulletin 5* (March 1960) of the *Louisiana Society for Horticultural Research* (available for $1.50 from Mrs. U. B. Evans, Haphazard Plantation, Ferriday, La.).

LYCORIS "SPERRYI" [Fig. 14.]

Information on the hardy golden lycoris that I wrote about in the 1958 HERBERTIA had been supplied me at the time by people in the Nashville, Tennessee area who knew it. Since then I have had opportunity to get acquainted with it first-hand, having observed its growth and bloom for three years. This is a wonderfully beautiful lycoris and valuable, too, because of its hardiness.

In brief, the history is that in 1925 a Nashville woman, the late Mrs. Henry Sperry, collected bulbs of what she called an "orange spiderlily" in the hills near Huchow, China, while visiting her daughter, a Methodist missionary stationed there. Mrs. Sperry brought them home, and for more than 30 years they grew and were treasured just as pretty flowers by her family and a few friends. No one knew that they were lycorises. In 1957 they were called to my attention, and I felt at once that here was something unusual. One of the greatest thrills in years of gardening came in August, 1958, when I saw a clump with four fine scapes in bloom in the Nashville garden of Miss Aileen Bishop.

Fig. 14. *Lycoris "sperryi"* in garden clump, Nashville, Tenn. Aug. 15, 1958. Scapes 24" to 31" tall; umbels 7" to 8½" across. Photo by Sam Caldwell.

Lycoris "sperryi," a name we are using for convenience until it is properly identified or named, is a big and showy flower, in general resembling *L. aurea.* Scapes have varied in height from 22 to 31 inches, topped with umbels seven and a half to eight inches across, made up in most cases of six flowers. However, one five-flowered and one seven-flowered umbel have been observed among some 20 scapes that I've seen. Individual flowers are large—three and a half to four inches across—and flattened segments measure three-eighths to one-half inch in width. The color is rather stronger than in *L. aurea* and is close to "strong orange yellow," Munsell Hue 7.5YR 7/11 on the Nickerson Color Fan. The blooms are fertile, setting very large seeds—to three-eighths of an inch in diameter—to their own pollen and apparently crossing with several other species.

Leaves look much like those of *L. squamigera* but are notable for their late appearance. In fact, the leaves of *L. "sperryi"* and of the new *L. chinensis,* both pushing up in early March, are the very last of the "spring foliage" lycorises to show up in my plantings. This accounts partly for their hardiness, since the leaves naturally escape the coldest winter weather.

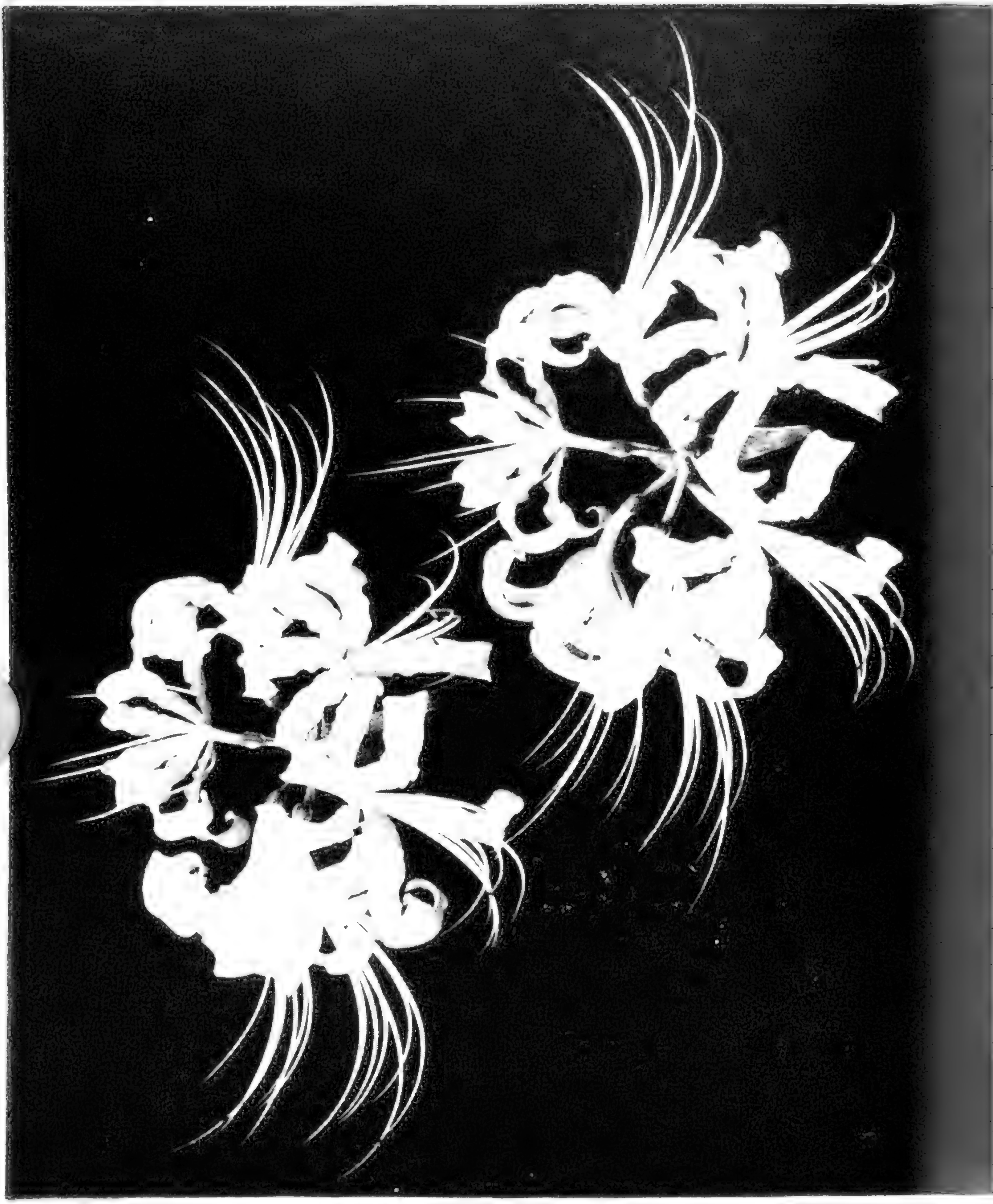
From the first it was quite clear that *L. "sperryi"* is different from and far hardier than both *L. aurea* and *L. traubii,* the two well known yellow-flowered species. I thought, however, that it would probably turn out to be identical to *L. chinensis,* the newly named hardy yellow lycoris growing at the USDA Plant Introduction Garden in Glenn Dale, Maryland. As yet it has not been possible to make a direct comparison of fresh blooms (my one bulb of *L. chinensis* has never flowered), but foliage comparisons and certain other evidence tend to indicate at this time that they are not the same.

Lycoris "sperryi"—or whatever its final designation may be—will be most important in extending northward the zone in which a yellow lycoris may be grown outdoors. I regret that there is absolutely no supply of bulbs at this time. The very few people in Nashvile who have them will not part with them. And at best, the number here must be small. In 1958 Miss Bishop allowed me to dig and reset one of the two clumps in her garden. We were able to learn that it had been planted originally in 1942, presumably with one bulb. Yet after 16 years, when I lifted the clump there were only five large bulbs and one small offset.

I collect all seeds and have distributed a few seedling bulbs. Sadly, the entire 1960 seed crop was eaten by a chipmunk. Whether conditions will ever be so that we can get bulbs out of China, I do not know. Mrs. Sperry's daughter tells me that they were fairly plentiful in the hills and mountains between Huchow and Hangchow in Chekiang Province.

NEW ACQUISITIONS

During the past year or two a few American bulb dealers have been offering "Lycoris cinnabarina." The name also has appeared in the wholesale catalog of the Van Tubergen firm in Holland, from whom, I



suppose, our dealers secured their bulbs. My impression is that botanists do not recognize this as a valid name, but hearing the plant described as "an orange *L. radiata*," I added a few bulbs to my collection a year ago. They were small, much like those of *L. sanguinea*, and on the whole have been slow to make any kind of start. Very little foliage has been produced, and I anticipate a wait of at least two years for bloom. My guess is that it will resemble *L. sanguinea*.

In August of this year I received three nice bulbs of *L. kiushiana* from B. Y. Morrison, Pass Christian, Mississippi, who had secured them direct from a bulb fancier in Japan. These I shall watch with interest. One Japanese authority gives it species status; another describes it as a larger flowered variety of *L. sanguinea*.

Incidentally, I had known of Mr. Morrison and his USDA and American Horticultural Society work for years, but met him personally only last fall when I stopped for a day at "Back Acres," the fascinating home, garden and nursery near Pass Christian, over which he is a guiding spirit. It was a joy to find someone else as nutty about odd plants—and especially lycorises—as I am. I envy him the balmy Gulf Coast climate where lycoris leaves grow lush and bulbs wax fat and bloom much better than they do for me. But I gathered that some species are reluctant to flower even in that favored spot.

By far the most interesting new lycoris that I grew in 1960 also came from Mr. Morrison, under the simple designation, "White No. 1." [Fig. 15] He has numerous bulbs supposed to bear "white" flowers, secured at various times from New Orleans seed stores, from other commercial sources and from southern farm women. My own experience with lycorises of this sort—bulbs bought under such labels as "alba," "albiflora," "albiflora carnea," "albiflora rosea," and the like—is that most of them run uniformly to the salmony pastel type that Dr. Traub named *L. elsiae* (HERBERTIA, 1958). Mr. Morrison has plenty of that kind, all right, but he also gets many variants. I saw a Kodachrome of one large clump in which flowers ranged all the way from white through cream, apricot and pinkish tints to quite deep salmon. And during the past bloom season I had wonderfully enthusiastic "lycoris bulletins" from him telling of pale, clear yellows.

Bulbs he sent me as "White No. 1" and "White No. 2" were planted in a deep box in my small greenhouse, where they flowered in late August. Delicately tinted flowers of this sort look different in different lights, tend to change from day to day and finally fade to near white. It is difficult to record on color film, on paper with the aid of a color chart, or even in the mind, a precise impression of the exact colors. When "White No. 2" opened I thought it was typical *L. elsiae;* the form was the same and the color was about as I remembered it. But later, when my own *L. elsiae* bloomed I concluded that "White No. 2" actually had been a deeper pink—at least, in the fresh flowers.

Fig. 15. (See opposite page)—*Lycoris* (White No. 1), an unidentified lycoris bought in New Orleans seed store by B. Y. Morrison. It somewhat resembles both *L. elsiae* and *L. boudyshelii.* Photo by Sam Caldwell.

There is no doubt, however, that "White No. 1" is distinct and different from *L. elsiae*. Segments are broader and much more reflexed and rolled back at the tips. Long-extending stamens and pistils give a width of over eight inches to the umbel, making it a larger lycoris than *L. elsiae*. The three scapes produced on my bulbs were respectively 11, 14 and 16 inches high and had five, six and six flowers to the umbel. Color at first is a soft pinkish yellow—not greatly different from *L. elsiae* coloring but with more yellowish influence—and this ages almost to white, while retaining yellow-cream tints. Mature, nearly white flowers remind one of *L. houdyshelii*.

I carefully fertilized flowers on two of the scapes with pollen from *L. radiata* and *L. "sperryi,"* which happened to be in bloom, but got no "takes." The third scape developed to its own pollen, apparently, one capsule containing a single large, shiny, black seed, which I planted.

Since these blooms were produced quickly from recently dug bulbs reset in a greenhouse box, measurements given above may not be typical. I suspect that scapes from established bulbs will be taller. In any event, it is a very fine lycoris.

Both of these numbered "whites" began pushing up foliage blades in the manner of *L. radiata*, soon after flowers faded, but blades are broader and longer than in *radiata*—in fact, quite like *L. elsiae* foliage. As yet I know nothing of how hardy these bulbs are. They have proved, of course, well adapted to the Gulf Coast country, but I fear that, like *L. elsiae*, they will exist but not exactly thrive and bloom freely in middle Tennessee.

I hope that Dr. Traub and other botanists can decide whether these variants among the "white" lycorises should be classed as different species or just varieties of species we have already. Meanwhile, they are interesting and beautiful garden material for whoever can grow them.

HARDINESS

We need more observant gardeners to report on the performance of lycorises in different localities. While other factors undoubtedly affect their flowering, it is reasonably certain in the Upper South that the severity of winters has much to do with it. After a particularly bitter winter we have learned not to expect much bloom on *L. radiata*, which is widely grown here. This seems reasonable, in view of the fact that near-zero temperatures and drying winds damage the persistent foliage.

But several strains of *L. radiata* are in cultivation, and some of these may tolerate more cold than others. 1960 was not a very good lycoris year in the Nashville area—rather to have been expected, because the 1959-60 winter was long and cold and brought 37 inches of snow.

Fig. 16. (See opposite page)—Delicately colored *Lycoris elsiae* does well where winters are not too cold. Photo by Sam Caldwell.

When fall came, bloom on *L. radiata* was generally sparse. Yet the fertile strain of this species, though blooming toward the end of August which is later than usual, made a grand display—fully up to normal. Also there were isolated clumps of *L. radiata* imported from Japan in recent years that bloomed very well. And quite late—on October 5—I observed in a local nursery a block of several hundred bulbs of a fine, large form of *L. radiata* that seemed to be giving nearly 100% bloom. The owner said they were long-established bulbs, secured through regular trade channels—presumably from Japan—some years ago. It is true that they are situated on a south slope in a sandy clay that suits them just right, but I am going to try bulbs of that stock in different situations to see if they are extra reliable in flower production. It takes so many years actually to learn anything definite about matters of this sort that I hope other people are working at them, too.

Reluctantly, I have given up trying to grow *L. traubii* outdoors here. Bulbs held on for a while outdoors but never bloomed. Then sub-zero weather in the 1957-58 winter killed all of mine outright. I know of one planting in a protected spot in a Memphis, Tennessee garden where they have done very well. But our Nashville winters are colder.

Some of the "border line" types, such as delicately colored *L. elsiae* [Fig. 16], which just barely gets by outside for me, I am trying out now in a permanent ground bed surrounded by a board frame. A sash covered with polyethylene film is put over it in bad weather.

PROBLEMS

Everyone who gardens has problems. Following are questions about lycorises that I'd like to have answered. Perhaps some reader can help.

1. Is there really such a plant anywhere in cultivation as *L. squamigera* var. *purpurea?* The few times I have found bulbs thus listed, they turned out to be something else. "L. purpurea" is seen in catalogs and lists from time to time. These, in my experience, invariably prove to be the fine hardy species, *L. sprengeri*. An interesting angle is that "L. purpurea" bulbs are usually offered at 50¢ to $2.00 each, while *L. sprengeri*, when bought under its correct name, costs about $5.00.

2. What is the true identity of the lycoris we can currently buy as *L. sanguinea?* Certainly it does not produce either the "dull red" or the "blood-red-scarlet" flowers I read of in a couple of supposedly authoritative descriptions of the species. Bulbs I have from several sources all give in July plain little flowers nearest to "strong reddish orange," Munsell Hue 10R 6/12, which fades badly in sun. Could they be *L. sanguinea* var. *cyrtanthiflora*, said to have "flowers apricot-colored, bleaching in the sun to a gray color"?

3. Has anyone ever made a direct comparison of *L. argentea* and *L. haywardii?* I think it's possible they may be the same thing.

4. If the yellow lycoris of St. Augustine, Florida is true *L. aurea*, as most of us assume, how do we reconcile facts with the description (in *Amaryllidaceae: Tribe Amarylleae*), "leaves produced in May . . . flowers . . . in August"? Flowers, as they come in September and October in St. Augustine, are close enough to the description, perhaps, but "leaves in May" is completely off, since they actually start in October or possibly late September in Florida.

[EDITORIAL NOTE:—The application of the name *Lycoris aurea* will be determined by the writer in the not too distant future by an examination of the herbarium specimens in European Botanical Institutions. The true *L. aurea* apparently is a hardier plant than the St. Augustine plant, and thus most likely has the habit of producing leaves in May in northern locations. Only the examination of the type material can settle this point.—Hamilton P. Traub]

HYBRIDIZING CYRTANTHUS

GORDON MCNEIL, *North Transvaal, Republic of South Africa*

It was the late Miss K. C. Stanford of BLOEMERF, Stellenbosch, well known to most readers of HERBERTIA, who first interested me in the possiblities of hybridising the Ifafa Lilies. On a visit to us she showed so much enthusiasm over a particularly fine clump of CYRTANTHUS SANGUINEUS in full bloom that I, there and then, became bitten by the bug. Miss Stanford, on her return home, sent me bulbs of *C. obliquus* and *C. spiralis* to use in the experiments.

My first break occurred in 1953 when the seedlings, from a pod of the cream form of *C. mackenii* pollinated with *C. sanguineus*, began to flower. Colors ranged from a very pale salmon to the tomato red of *C. sanguineus;* trumpets, five to nine on a 12″ stem, averaged 2½″ long by 1½″ wide across the slightly reflexed lobes. This F1 selfed gave some very nice plants (Fig.17); the flowers are bigger (often as big as those of *C. sanguineus);* the color range is considerably extended from a very pale pink (the color of trout's flesh) to a dark red; heads are multiflowered on longer stems; the tepalsegs often appear as if dusted with gold (a characteristic of some forms of *C. galpinii* but not of either *C. sanguineus* or *C. mackenii);* there also appeared typical *C. sanguineus* flowers but streaked with darker red—one green lobed (chimeric, I believe); one with five flowers instead of the usual one or two, etc. Some of these are now in the F3 stage but still show great variation and also a steady retrogression to *C. sanguineus.* The F2 seeds give the best results. The bulbs are tender and produce few offsets. However another cross *(C. parviflorus* by *C. mackenii* x *C. sanguineus)* has recently flowered and is much more promising as a hardy garden flower. It appears closer to *C. parviflorus* and *C. mackenii* in its foliage, hardiness and ability to produce numerous offsets and has most delightful trumpets; 1½″ to ¾″ wide; 3 to 9 on a long stem (18″); in color, pastel shades of pink, salmon, tomato red and red.

I have many other hybrids—attempts to get my first break, using *C. sanguineus* pollen on various colors forms of *C. mackenii;* on *C. o'brienii* and *C. parviflorus.* These most resemble, I believe, Mrs. Henry's *Cyrtanthus* hybrids. Some are very nice and all are hardy.

Of unflowered crosses I have the following: *C. sanguineus* x *C. obliguus; C. sanguineus* x *C. tuckii* var. *viridilobus* & the reverse; *C. sanguineus* x *Vallota speciosa; C. sanguineus* x *Anoiganthus luteus; C. sanguineus* x *Anoiganthus breviflorus* & the reverse; *C. sanguineus* x *C. galpinii* & the reverse; *C. sanguineus* x *Clivia miniata* & the reverse; and a *Vallota* x *C. obliguus* cross from Sweden which should prove a beauty.

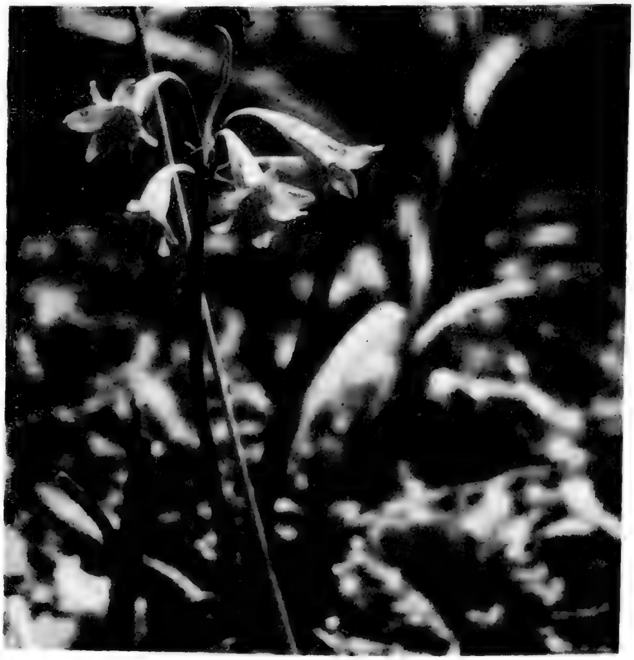


Fig. 17. Hybrid *Cyrtanthus* raised by Gordon McNeil, South Africa.

Apropos the intergeneric crosses, *Cyrtanthus* & *Aneiganthus* are very close and differ only in that *Anoiganthus* has "no tepaltube" (actually from my observation *A. luteus* has a tepaltube, though short) and in the opinion of Dr. Dyer (see HERBERTIA, 1939) should probably not have been separated; *Vallota* has the same basic chromosome number as *Cyrtanthus*, x = 8; *Clivia*, in the opinion of Dr. Wilsenach of the University of the Witwaterstrand, is related to *Cyrtanthus*. Another *Cyrtanthus (C. thorncroftii)* that I am using in the experiments also has, like *Anoiganthus* breviflorus, "no tepaltube."

Through the kindness of Dr. Ising I have obtained triploid and tetraploid plants of *Cyrtanthus*, which will flower this coming spring

and which I feel sure, will prove outstanding parents; particularly the tetraploids.

I am only beginning. There is an immense amount of work yet to be done and I hope this introduction to the subject may inspire others with more time to start hybridising the Ifafa Lilies of which there are in Africa (see Dyer—HERBERTIA, 1939) some 44 species. As pot plants they are excellent; also as cut flowers. Many are delightfully scented and a mass planting of *C. mackenii* in any of its color forms is a joy indeed.

HYBRID BRUNSVIGIA AND X CRINODONNA NOTES, 1961

HAMILTON P. TRAUB, *California*

The season of 1961 was unusual from the standpoint of flowering dates. During the previous winter season only about 3.5 inches of rain fell and this may have something to do with the results.

Brunsvigia rosea var. *major*, the early-flowering, many-flowered form of the Cape Belladonna, (and *B. purpurascens* var. *major* from Van Tubergen, which is the same plant under a different name), and also X *Crinodonna trubii (B.* x *parkeri* x *Crinum moorei)*, and *Crinum moorei rosalba*, began to flower in the first week in June, and continued on through July. Later other X *Crinodonna* clones began to flower so that there was a continual bloom on through to October.

One outstanding record for the early flowering of X *Crinodonna traubii* from seeds was set. From a lot of seedlings of *Brunsvigia* x *parkeri (Zwanenburg Group) x Brunsvigia rosea major*, raised from autumn 1959 seeds, one plant bloomed in the last week in June, 1961, about 21 months from seed planting time. This same plant again flowered in October. It is hoped that such performance can be obtained on a greater scale.

VEGETATIVE PROPAGATION OF BRUNSVIGIA ROSEA.—Each of two bulbs of *B. rosea major* were cut vertically into quarters in October 1960, and placed *in a pot of sand* with the sand between the quarters, and watered regularly. On August 2, 1961, when the cut pieces were removed, it was found that each quarter had produced two bulblet sprouts. This is a 1—8 increase. Thus in the case of some *Brunsvigia* x *parkeri* bulbs that do not make offsets, this method should be tried. It is hoped that Mr. Hannibal and others will report on such experiments in future issues of the Year Book.

CRITERION FOR HYBRIDITY.—In the case of crosses between *Brunsvigia rosea* or *B.* x *parkeri* on the one hand, and *Crinum moorei* or *C. bulbispermum*, on the other, it is possible to tell soon after the seedlings sprout. The seedlings soon produce several leaves; soon show a true neck and in addition remain evergreen. Seedlings that are not hybrids usually make only a few leaves; do not make a true neck, and go dormant in late spring.

NOTES ON CRINUM BREEDING

L. S. Hannibal

"The field of *Crinum* breeding is wide open—There is much to be learned of this group." We credit Dr. Thad Howard for this frank recognition of a longstanding difficulty; one which deserves rather considerably more attention than has been granted in the past. Of all the better known Amaryllidaceae the *Crinum* species have been the most neglected. Breeding has been nearly static in this group because we seemingly lack information or the knowhow on what plants to use and how to cross them in an advantageous manner. There are several reasons which may account for this: First we have never collected many of the higher mountain species which have possibilities as hardy breeders and secondly we have overlooked the potentialities of several fertile hybrids which are capable of producing viable second generation seedlings.

Basically the problem also resolves about our past inability to recognize and use the interrelations of various species and breed with those closely related forms where incompatabilities are less likely to occur. Crinums are no more difficult than Nerines or Daffodils. For the layman there is no better way to solve the problem than to evaluate the seeding and growing habits of our known hybrids. Vigorous free seeding hybrids normally indicate close parental relationships whereas reluctant seeders or slow growing seedlings may suggest wider evolutionary interrelationships. More can be learned than suspected, as examples will show.

Unquestionably everyone knows *Crinum moorei.* It is native to a good portion of the Union of South Africa and many local strains exist. With a few exceptions most plants are free seeders and many intraspecific crosses exist, yet, few represent significant improvements over long existing garden forms. The writer considers only a few worthy of description: One grown here in Fair Oaks requires rather deep shade to grow properly. The foliage is a dense green and the clone throws rather deep pink blossoms with broad tepalsegs. A second carries relatively clean foliage on a long pseudo-neck and the blossoms which are rather open and flat faced are carried on a tall scape. Both plants are decided improvements over the average garden stock, but require relatively warm weather to flower and rarely produce seed. The desirable features found in the foliage and blossoms may not be transmitted to their progeny even in F-2 backcrosses. In this specific instance we can note that even intraspecific breeding has its difficulties.

As far as interspecific *Crinum* hybrids are concerned many people have used *C. moorei* as a breeder. It will cross with a great number of other species but, with the exception of the Powellii hybrids and *Crinodonna*, only a few of these hybrids have ever reached the market. A lack of hardiness, reluctance to flower, few offsets, or poor floral form have kept most of these hybrids off the market. In the various *Crinodonna* crosses the floral coloring and width of the tepalsegs is controlled

essentially by the particular *Brunsvigia rosea* cultivar employed in the cross. The same applies to the Powellii hybrids as will be clarified below.

Crinum bulbispermum has been known for 150 years or more. The white flowered form from the Cape of Good Hope (Ex. *C. capense alba)* has been a garden favorite in England due to its winter hardiness. This variant has become an escape in a number of semi-tropical areas, particularly in Costa Rica where it has confused honest botanists to no end. This white flowered strain from the Cape peninsula when crossed with *C. moorei* (probably the white flowered form var. *schmidtii)* has given rise to the clone *C.* x *powelli album.* Similar crosses with pale pink forms of *C. moorei* has given rise to very light pink Powelli forms. In contrast, light pink forms of *C. bulbispermum* like the photosensetive form distributed by Wyndham Hayward some twenty years ago (A plant which flowered pink on overcast days) has been the source of a number of light rose or coral pink Powellii forms. Major Pam's 'Pink Queen' is an excellent example of this color type. Then some ten years ago Dr. Rodin obtained seeds of a deep red flowered *C. bulbispermum* for the University of California Botanical Garden at Berkeley. This plant is a type which is very common to the entire Orange River basin in the eastern part of the Cape Province. This particular form was first described by John Barrow in his official report of 1801 on his travels into the interior of the Cape Area on page 205. A good reproduction in color has been featured recently in the Cape Provincial Administration's illustrated booklet on 'Protected Wildflowers of the Cape'. Mature bulbs of this red flowered form are quite large and very free flowering. The plant makes several scapes during the early summer and each umbel carries 15 to 25 blossoms. The strain produces few selfed seedlings and these are seldom hardy enough to survive a cool California winter, but pollen from the white or pale pink *C. bulbispermum* clones take on the red with rather striking results as the intraspecific seedlings grow vigorously enough to flower in four or five years. The blossoms from these crosses are rather pale pink. In contrast the Powell hybrids obtained by crossing with *C. moorei* are almost blood red. Offhand it appears that *C. moorei* contributes very little of the color to the Powellii hybrids, but that *C. bulbispermum* color in the hybrid is considerably intensified by *C. moorei.*

The white Powellii hybrid is absolutely sterile. Major Pam's 'Pink Queen' and one or two others occasionally produce malformed seed, and *C.* x 'Cecil Houdyshel' which is presumably a Powellii hybrid often sets some near normal seed. The writer has flowered several F-2 plants derived from 'Cecil Houdyshel'. These are poorer forms of the parent and have shown no inclination to produce seed.

A third hardy species of Crinum with breeding possibilities is the white flowered *C. yemense.* This plant is often confused with *C. latifolium* from the Asiatic area. Presumably these two species and others

growing in the higher elevations of tropical East Africa all have a common ancestry. *C. latifolium* requires warm humid conditions, but *C. yemense* which comes from the mile high cloud moistened rim of the western edge of the Arabian plateau is equipped to survive long dry spells and grow with a minumum of moisture. Like *C. bulbispermum* it can tolerate some frost and prolonged cold spells which isolates and identifies it from its near Asiatic relatives. It is best recognized by the large seed which are often two inches in diameter. The reserve moisture permits such seed to lie dormant for three or four months until winter conditions favor germination. The van Tubergen form of *C. yemense* (Gardeners Chron. & Gard. Illustrated, P.421, May 1960) is not quite as large or as hardy as the form *C. yemense* var. *burbankii* (Gard. Chron & G. I., Vol. 144, #23, P. 293). However both plants are good

Fig. 18. Crinum hybrid, "Miss Elsie."

garden subjects and have exceptionally clean and attractive foliage. The Luther Burbank hybrid *C.* x 'White Queen' (HERBERTIA 1935, P. 160) may be a *C. moorei* x *C. yemense* cross. The hybrid has clean upright saber like leaves resembling the Yemen species and white flowers which are intermediate in form. The cross has been duplicated by the writer. 'White Queen' requires near full sun and a warm summer in order to flower. From all appearances the cross is sterile and no color is introduced by *C. moorei* into the blossoms although red pigment is evident at the leaf base.

A hardy hybrid belonging to the subtribe *Platyaster* is the little known *C.* x 'Miss Elsie' (Fig 17). It appears to be an American development but the parentages involved are unknown. The foliage is quite erect and near needle tipped like a Yucca. Five to eight pure

white spidery like blossoms are carried on each scape some 36 to 42 inches above the ground. Occasionally seeds form but rarely grow much larger than a pea. To date none has been known to germinate.

One can cite *C.* x 'Ellen Bosanquet', 'George Harwood' and a number of other hybrids. All are completely sterile or yield a few aborted seed. With the exception of *C.* x 'Cecil Houdyshel' none have been known to actually produce a hardy F-2 hybrid. The general conclusion is that most of the small aborted seed is parthenogenetic and not sexual, and that this accounts for the fact that seed sets at all. Hybrid seeds of the initial F-1 cross (which is sexual) generally fall into three classes: Seeds which produce plants showing hybrid vigor and are capable of flowering in three to five years, seeds which yield slower growing plants with no greater vigor than the parents, and seeds which produce plants significantly less vigorous than the parents where genetic incompatibilities may exist. F-2 seeds, if sexual, appear to be obtainable only from F-1 plants showing considerable hybrid vigor like *C.* x 'Cecil Houdyshel', and even in this instance the F-2 seedlings have far less vigor than the F-1 hybrid. Similarly the semi-vigorous F-1 hybrids seemingly yield only aborted parthenogenetic seeds, or are sterile.

As far as known there is only one hybrid *Crinum* of the hardy class (which excludes the tropical Asian hybrids) that is capable of producing vigorous F-2 segregates and this plant is the long ignored *C.* x 'Luther Burbank'. The great broad recurving leaves of this hybrid resemble those of *C. bulbispermum* and have generally misled most *Crinum* collectors into assuming that *C. bulbispermum* was employed by Luther Burbank in this cross. However the black anthers and open shape of many of the blossoms to the F-2 segregates suggests that *C. macowani* may be one parent. The breeding behavior with *C. moorei* and *C. bulbispermum* apparently eliminates these species as the latent parents as will be discussed below. But despite these difficulties regarding parentages the plant is a free seeder and has wide possibilities as a breeder. For example either *C.* x 'Luther Burbank' or its seedlings will cross with *C. moorei* when the latter is the pollen parent and give rise to some very slow growing seedlings with slender *moorei* like foliage. The plants are very difficult to flower and are apparently sterile. In no way do they resemble the Powellii hybrids. In contrast *C.* x 'Luther Burbank' will cross with all of the *C. bulbispermum* variants to yield intensely vigorous hybrids which are easily flowered in three or four years. Those crosses on the white form of *C. bulbispermum* resemble *C.* x 'Louis Bosanquet' so closely in foliage, open umbel, and flower form that there is a possibility that this was the combination used by Mr. Bosanquet.

Similar crosses on the red flowered 'Orange River Lily' also resemble *C.* x 'Louis Bosanquet', but the plants are far larger and much more vigorous and the blossoms are colored a deep coral pink. The initial hybrid obtained between a Burbank F-2 seedling and the Orange River Lily has been named 'Cape Dawn'. Interestingly enough several Burbank F-2 seedlings have acted as pollen parents in this cross and all

bulbs flowered to date have been clonal in similarity. The tall scapes carry umbels of seventeen to twenty blossoms on relatively long pedicels. The bright colors make a good show in the garden and individual umbels are particularly suitable for floral arrangements due to the open spacing and lasting quality of the blossoms. The new hybrid apparently produces no seed on selfing but evidence indicates that backcrosses may occur. As a consequence the writer has initiated a two objective breeding program: First to obtain improved segregates in the Burbank seedling group, and secondly to intercross these with the 'Orange River Lily' or its lighter colored intraspecific crosses to obtain a complete series of light to deep pink segregates. A third phase is to explore the possibility of obtaining backcrosses. Since seeds of the 'Cape Dawn' type have been distributed to *Crinum* fanciers we should be hearing from others concerning the 'Cape Dawn' siblings. They too should participate in this third phase study.

In summing up our observation, *Crinum* hybrids are better understood than first supposed. We have some inkling as to which parents accentuate or suppress color, and we have some clearer views where to look for viable or semiviable hybrids. The one field not explored is that of backcrossing using pollen from hybrids on parental species—There are possibilities here. There are also possibilities in repeating old crosses to obtain improved forms and colors. And above all there are additional hardy species to obtain and cross in order to open up the breeding field. Unquestionably *C. yemense* and *C. johnsonii* should cross and give fertile hybrids which can be interworked with *C. latifolium*, *C. macowanii*, *C. gouwsii*. Several of the other South African species also warrant additional investigation. Finally the work should not be limited to hardy forms, but extended to the subtropical Crinums. Our friends in Florida and along the Gulf should have a field day too.

ZEPHYRANTHES BREEDING NOTES

E. L. Brasol, *Florida*

Zephyranthes candida has the capability of producing numerous bulblets by the splitting of the mother bulb as in some sorts of *Narcissus*. It was with the purpose of transferring this reproductive habit to hybrids that the trials of crossing *Z. candida* with other Zephyranthes species was undertaken many years ago.

Z. candida is the latest in the season to bloom, and thus I had to use pollen from stragglers of any species which bloomed at such a late date. One of these stragglers was *Z.* x *ajax* and there was one other. Only the cross of *Z.* candida ♀ x *Z.* x *ajax* ♂ set seeds. Among the seedling progeny there were two color variations:

(a) one with yellow flowers smaller than *Z.* x *ajax*, a very shy bloomer, fairly late blooming, later than *Z.* x *ajax*, but earlier than *Z. candida*, which is named *Zephyranthes* x *ajax* 'Brasol's Yellow' (syn.-"Candjax").

(b) one with cream-colored flowers larger than those of *Z. candida*, a profuse bloomer among the earlier sorts, which is named *Zephyranthes* x *ajax* 'Brasol's Cream' (syn.- "Candidax").

The synonyms indicated have been used up to the present, but these names are not acceptable according to the Code for naming cultivated plants since they are so nearly alike that confusion would result. Therefore, the more distinct names are proposed.

Since all back crosses are members of an original hybrid, the back cross *Z. candida* ♀ x *Z.* x *ajax* ♂ remains part of the latter. *Z.* x *ajax* is the result of *Z. candida* x *Z. citriña* (see PLANT LIFE *15:* 39. 1959.)

I began to sell them under the synonym names in the late thirties, but these names were never published and thus the transition to the properly published names is easy.

However, neither of these hybrids acquired the feature of bulb-splitting, and so far neither of them ever set any offsets for me, and the cultivars have been propagated by means of seeds. Now that a new color has been added to the dainty array of Rain Lilies, one may be satisfied since "all's well that ends well."

HYMENOCALLIS REPORT FROM OHIO

Len Woelfle

The summer of 1961 was not particularly fruitful as far as hybridizing *Hymenocallis* is concerned. From hundreds of pollinations only four capsules of seed developed and of these two disappeared while the writer was away on business. I would guess they became a choice tidbit for a hungry bunny—we now have more than our share of his kind.

Bloom from *Hymenocallis* (subgenus Ismene) was unusually good this year. Most of my bulbs of 'Pax' bloomed, with up to seven blooms per scape. These were followed in quick succession by 'Icon' and 'Helios'. Then came the species *H. Amancaes, H. longipetala, H. narcissiflora, H. macleana* and the older hybrid clones 'Advance', and 'Sulphur Queen' and the hybrid *H.* x *festalis*.

Hymenocallis 'Pax' seems to be a truly outstanding hybrid in the Ismene section. It is colored essentially like 'Olympia' but has slightly smaller cups, and with the culture we must give them here, taller scapes and more blooms. This may not be true where fall digging and winter storage are not required. It differs from 'Icon' and 'Sulphur Queen' in that these have very pale yellow coloring and greenish keel markings inside the cup, whereas in 'Pax' the keel markings are yellow and the green is almost entirely absent.

'Icon' is the writer's cross #5003. To all outward appearances it is exactly like the 'Sulphur Queen' in growth and flower, as suggested by the name 'Icon', meaning a likeness, or image. Unlike the 'Sulphur Queen' however, it does not seem to have the habit of deformed blooms and crooked perianth tubes. These malformations are probably inherited from the seed parent, *H. narcissiflora* (syn. ***H. calathina***), on which the flowers in the umbel all face in the same direction, while in

the pollen parent *H. amancaes,* the placement is radial. The old clone 'Sulphur Queen' seems unable to decide which way the blooms should face.

'Helios' is the writer's cross #5208—of the same parentage as 'Sulphur Queen' and 'Icon'. This is truly a pastel yellow, several shades darker than 'Icon' and 'Sulphur Queen' and the color does not break to white after the flower opens. Here it seems to retain its color until the flower wilts.

It is my hope that these three new hybrids in the 'Sulphur Queen' complex, 'Helios', 'Icon' and 'Pax' can soon be made available commercially, so that all who are interested in these exotic amaryllids may have them.

The future should give us others, intermediate between the large-cupped *Ismene* section and the small cupped Amerindian Lilies from North America. Several crosses have been made and perhaps more definite information can be given in future issues of PLANT LIFE. Progress is slow in developing new hybrids in this group, but the near future holds promise of many good things to come.

NEW SOUTHERN AMARYLLIS HYBRIDIZERS AND GROWERS

BECKWITH D. SMITH,

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This summer, through correspondence with Mrs. H. W. Law, Chula, Georgia, I learned of a new strain of *Amaryllis* grown by Mr. O. J. Woodward of Tifton, Georgia. It develops that during 1933, or earlier, Mr. Woodward was Horticulturist at the Georgia Coastal Experiment Farm at Tifton, when he was growing the Mead strain *Amaryllis.* He selected a good red to improve on and subsequently originated a number of beautiful hybrids. Mrs. Law relates that his home is ideally located on low land of black, alluvial soil, with numerous large pines and other trees for shade. I hope to visit Mr. Woodward with Mrs. Law in the spring of 1962, when his hybrid Amaryllis are blooming.

Another comparatively new hybridizer, importer and grower is the Experimental Farm at Tampa, Florida, managed by Mr. Robert L. Solomon, P. O. Box 11653, Tampa 10, Florida. I bought many beautiful Dutch bulbs from this new grower in the early spring, and was particularly pleased with a group of large flowering California hybrids purchased from this source. This concern is offering many fine items in amaryllids, and I am sure will develop some beautiful new clones as a result of hybridizing the best available Dutch stocks.

A third grower of considerable note is Mrs. J. S. Barry, operating Barry's Nursery, at Route 1, Box 7, Prairieville, Louisiana. Mrs. Barry, for a number of years has been hybridizing fine quality Dutch bulbs and

[NEW AMARYLLIS HYBRIDIZERS, B. D. Smith, continued on page 128.]

CHROMOSOME BALANCE IN CYRTANTHUS

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I. INTRODUCTION

The genus *Cyrtanthus* contains nearly fifty species, endemic to the south-eastern part of Africa. A monograph of the genus was published in 1939 by Dyer. Only little is known, so far, of the chromosomes of *Cyrtanthus,* and of the closely related genera *Anoiganthus* and *Vallota. Cyrtanthus*-chromosomes were studied for the first time by Taylor (1926) who determined 2n = 16 in *Cyrtanthus parviflorus.* Later Sato (1938 and 1942) reported the number 2n=22 for *C. obliquus* and 2n=16 for *Vallota speciosa.* Mookerjea (1955) counted 2n=20 in *Cyrtanthus "Ifafa Lily"* ("a horticultural species"). It should be observed, however, that one cell with 16 chromosomes was found too. In *"C. sanguinea"* 2n=18 was reported by the same author. The chromosome number 2n = 16, and preliminary data on chromosome morphology, were given by Gouws (1949) for *Cyrtanthus tuckii* var. *transvaalensis, Anoiganthus breviflorus* and *Vallota speciosa.* The chromosomes of *Cyrthanthus lutescens* (2n=16) and of *Vallota purpurea* (= *V. speciosa*) (2n=16) were studied by Tjio and Levan (1950). The chromosome pictures given by these authors for *C. lutescens* are in good agreement with the idiogram of Gouws (1949) for *Anoiganthus breviflorus.* Transposing the chromosomes D and E of Gouws as well as F and G, complete correspondence is reached between the two systems.

In the present paper some cytological investigations in *Cyrtanthus* and *Vallota* are reported. An amphidiploid was artificially produced from a cross between two of these species. By back-crossing to the diploid and further crossings among the different levels of polyploidy, a wide variation in chromosome numbers was obtained. An analysis of the polyploid and aneuploid materials is the main object of the present paper.

II. MATERIAL AND METHODS

The material analysed comprises the following species:-

1. *Cyrtanthus parviflorus*	Origin unknown.
2. *Cyrtanthus lutescens*	Origin unknown.
3. *Cyrtanthus mackenii*	Botanical Gardens, Lund.
4. *Cyrtanthus "hybrida pink"*	South Africa (commercial variety).
5. *Cyrtanthus falcatus*	Botanical Gardens, Kew.
6. *Cyrtanthus sanguineus*	South Africa.
7. *Cyrtanthus obliquus*	South Africa.
8. *Vallota speciosa*	Origin unknown

Cyrtanthus parviflorus, C. lutescens and *C. mackenii* are dealt with in some detail. In some crosses also *C. "hybrida pink"* is included.

The technique of crossing is very simple in the present plant. It is not necessary to emasculate in advance, as the stigma is receptive one

or two days before the anthers open. By using a new toothpick for every pollination, contamination with undesired pollen is avoided. The anthers are removed directly after pollination. Since the plants are grown in a fly-proof greenhouse, isolation of the flowers is unnecessary.

The cytological technique used, will be described in a special paper by Oestergren and Heneen. Their schedule, with some adjustments for the present material, is the following:

Root tips are treated with a 0.1% solution of colchicine for about eight hours. This treatment is usually performed while the roots are still on the plant. One or two healthy roots growing through the hole in the bottom of the pot are immersed into the colchicine solution. After that the terminal 2-3 cms of the root tips are cut off and treated for four hours at 15 centigrades with 8-hydroxy-quinoline solution, usually in the concentration of 0.002 M. The roots are trimmed so that only the terminal cm is fixed. The fixative has the following constituents: -

Methanol	60 ml.
Chloroform	30 ml.
Distilled water	20 ml.
Dinitrophenol	1 g.
Picric Acid	1 g.
Mercuric chloride	1.1 g.

The roots are fixed overnight. Material can be left in the fixative for a few days without damage. The roots are hydrolysed in 1-N HCl at 60°C for 8 minutes and stained in the Feulgen reagent for two hours. After the staining the material is treated with pectinase (5 g. pectinase* in 100 ml. distilled water) for two hours. By means of this treatment the middle lamella is dissolved, leaving the tissue soft and easy to squash. A longer time in pectinase is not harmful but may make the material too soft for easy handling.

The extreme tips of the roots are squashed in 45% acetic acid under plastic coverslips. (Astrolon plastic 0.25 mm). Cells are easily separated from each other a monolayer resulting. By gentle pressure on the coverslip the surplus of acetic acid is removed and absorbed by filter paper. Spreading of the chromosomes is improved by gentle tapping with a match on top of the coverslip. Rubber solution is applied around the plastic coverslip and left for about half an hour to dry.

The slide is next scanned under the microscope for useful mitoses. Successful slides are made permanent as follows. They are placed overnight in acetone for dissolving the plastic coverslips. The rubber frames are soluble in xylol, but may more easily be removed manually by a forceps when the slides are still in acetone. The slides are passed through a series of acetone + xylol and three jars of xylol before being mounted in Permount or Balsam.

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*A commercial sample from Nutritional Biochemicals Corporation, Cleveland 28, Ohio.

Plate 1. 1. Metaphase I of *C. parviflorus;* 2. A drawing of the same plate; 3 Somatic metaphase plate of *C. parviflorus* x *C. lutescens.* Note the heteromorphic chromosome pair G; 4. Somatic metaphase plate of *C. obliquus;* 5, Somatic metaphase plate of *C. falcatus;* 6. Somatic metaphase plate of *C. sanguineus.*

III. CYTOLOGICAL RESULTS

1. Chromosome morphology of the diploids.

The somatic chromosome number is 2n=16 in all species studied: *Cyrtanthus lutescens*, *C. parviflorus*, *C. mackenii*, *C. sanguineus*, *C. obliquus*, *C. falcatus* and *Vallota speciosa*. Somatic metaphase plates of the hybrid *C. parviflorus* x *C. lutescens*, and of the species *C. obliquus*, *C. falcatus* and *C. sanguineus* are given in Plate 1. Karyotypes of all the seven species, and of the hybrid *C. parviflorus* x *C. lutescens*, are given in Plate 2. The chromosomes are arranged into eight homologous pairs, given the letters A to H. It is clearly seen from Plate 2 that there are similarities between the chromosome complements of *C. lutescens*, *C. parviflorus* and *C. mackenii*, which together form one group. Another group is formed by *C. sanguineus*, *C. obliquus*, *V. speciosa* and *C. falcatus*. In the former group no differences are observed between the karyotypes of *C. lutescens* and *C. mackenii*. Both of them have a characteristic secondary constriction on the long arm of chromosome G. *C. parviflorus* does not show this constriction and, furthermore, the long arm of G is slightly shorter than in the former two species. In the hybrid between *C. parviflorus* and *C. lutescens* the two types of chromosome G are apparent (Plate 2). The species of the latter group exhibit clear karyotypic differences especially in chromosomes E. and F. *C. falcatus* is characterized by a pronounced secondary constriction in the long arm of chromosome C.

As mentioned, the three species *C. parviflorus*, *C. lutescens* and *C. mackenii* (for convenience abbreviated C.p., C.l. and C.M.) will be dealt with more in detail. Their eight chromosome pairs form five easily identifiable groups, for which the following symbols, roughly indicating relative length and centromeric position are proposed:

Chromosomes	Symbols
A	V
B and C	L
D and E	j
F and G	l
H	i

Pair A—group V is the longest chromosome of the complement. Its centromere is nearly median.

Pairs B and C—Group L are the second longest chromosomes. Their centromeres are submedian.

Pairs D and E—group j are of medium size. D is usually slightly shorter than E. The centromere is almost terminal. The short arms of these two pairs are of similar length and smaller than any of the other chromosome arms in the complement.

Pairs F and G—group l are of medium size, and their centromeres are subterminal. Chromosome F can be distinguished from chromosome G by its slightly longer short arm. In addition it has a secondary con-

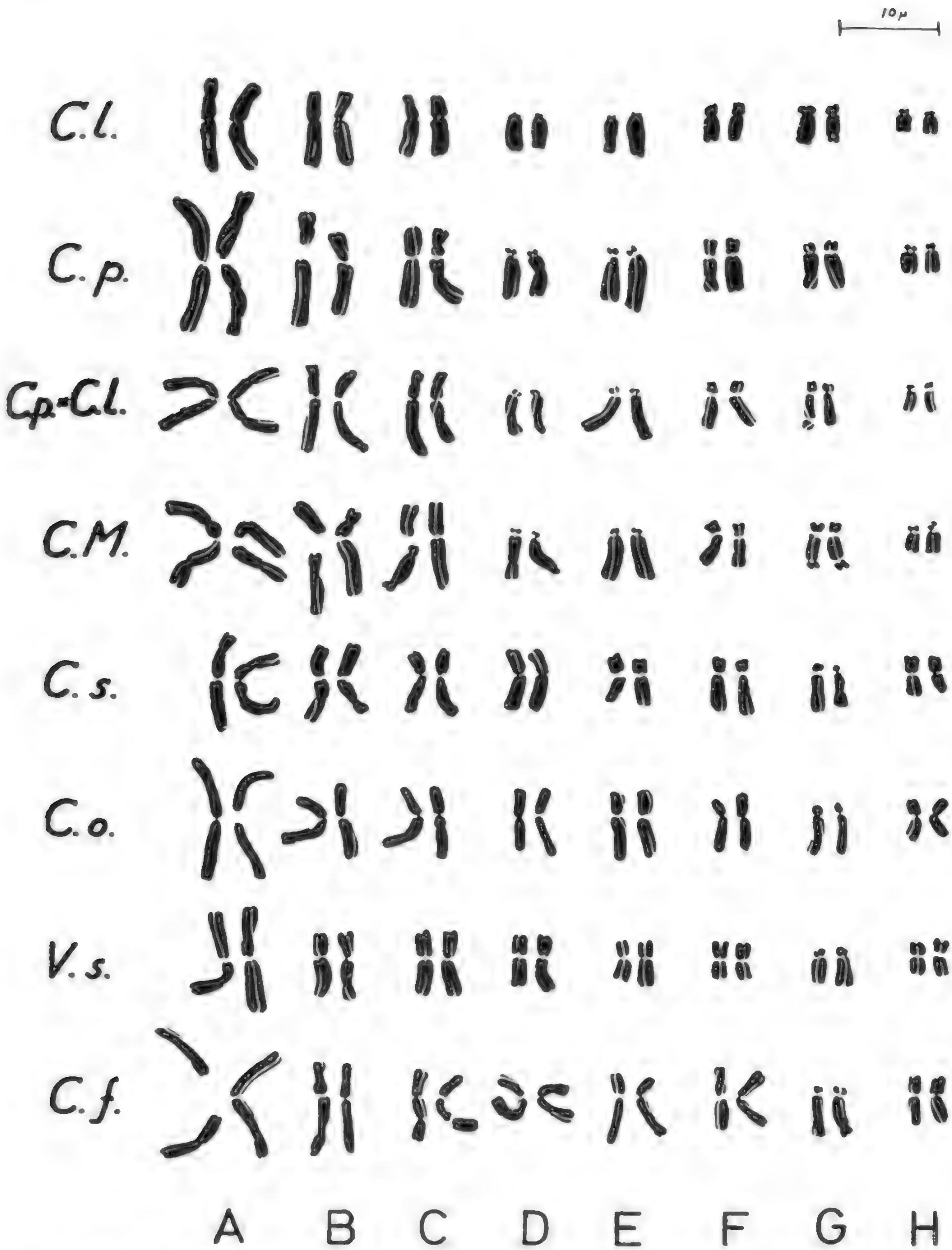

Plate 2. Karyotypes of **Cyrtanthus lutescens, C. parviflorus, C. parviflorus** x **C. lutescens, C. mackenii, C. sanguineus, C. obliquus, Vallota speciosa** and **C. falcatus.**

striction on the short arm dividing it into unequal parts: one longer distal and one shorter proximal part. It is probable that this secondary constriction is concerned with the nucleolus formation.

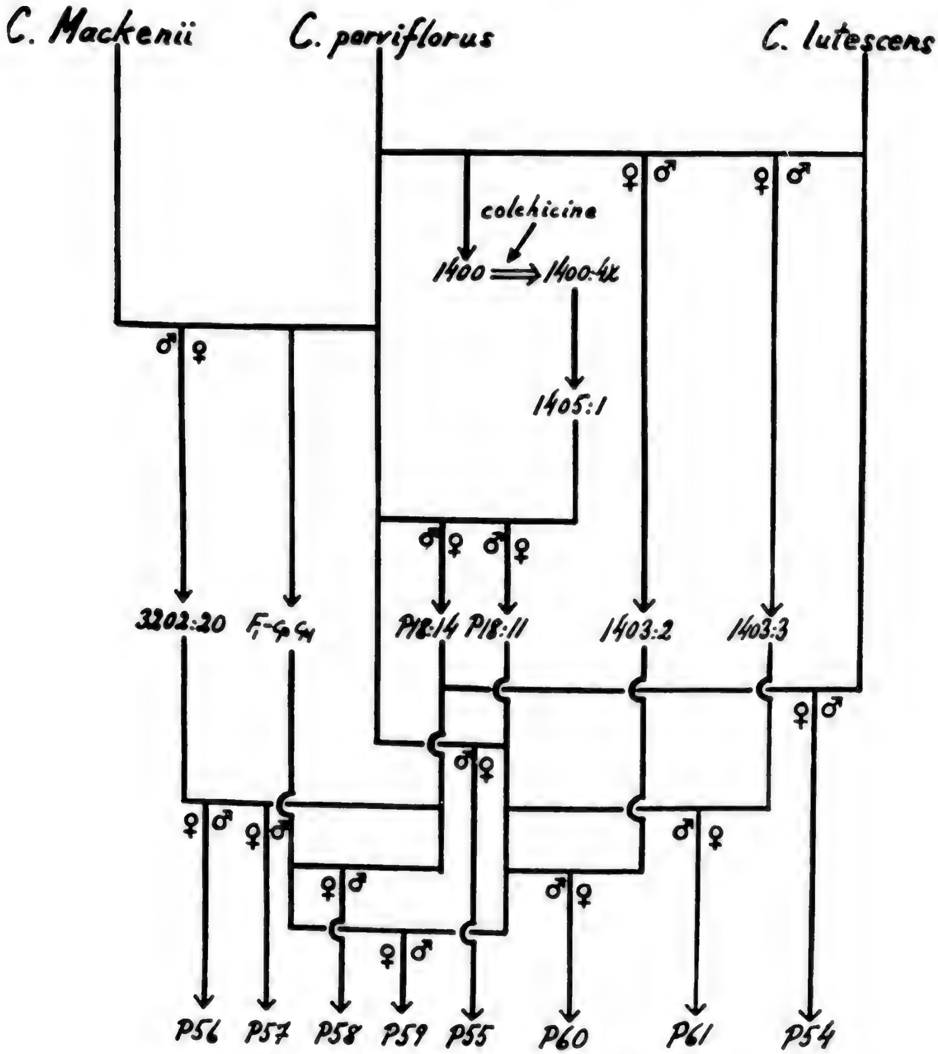

Plate 3. Programme of the crosses given in Table I.

Pair H—group i is the shortest chromosome of the complement, and its centromere is subterminal. Its short arm is slightly longer than that of group j (D and E).

The different groups may be identified even on meiotic chromosomes (Plate 1, fig. 1 and 2).

In order to describe the chromosome constitution of any individual, diploid, polyploid or aneuploid, the number of chromosomes present in each group is given below the symbol of that group. For example,
VLjli
24442 represents the constitution of the normal diploid complement. For the sake of simplicity the five number formula will be given without the group symbols, thus, the normal complement: 24442. It should be observed that in groups L, j and l, which include two chromosome pairs each, extra chromosomes of aneuploid complements are not individually defined by the formulas. For example, the formula 25542 indicates a double trisomic for one chromosome of group L (B or C) and one of group j (D or E). Accordingly, there will be four combinations possible: 2x+B+D, 2x+B+E, 2x+C+D and 2x+C+E.

2. *Origin of the chromosome number variation.*

In 1952 a cross between C.p. and C.l. was made. The seeds obtained from this cross were treated with colchicine. Out of 155 seedlings only one survived. In 1955 this plant came into flower. Two flower stalks were formed, one of which developed from a lateral bulb. The flowers of the latter stalk had a darker red colour than those of the primary stalk. After transplanting to a separate pot, this lateral bulb gave still more intensively red flowers than when attached to the diploid bulb. This plant turned out to be a tetraploid with 2n=32 and was labelled 1400:4x. After selfing, five flowers gave four capsules containing 54 seeds, from which 47 plants resulted.

In the tetraploid offspring one plant, no. 1405:1 (2n=4x=32), was pollinated with pollen from C.p. In this cross two near-triploid offspring plants, P 18:11 and P 18:14, resulted, both with the chromosome number 2n=23. They were found to be disomic for the largest chromosome of the set (A). These two individuals were crossed with diploid species and diploid hybrid plants. A chart over these crosses is shown in Plate 3. Two other charts arranged in the same way are given in Plate 4. These charts will be considered when dealing with the different types of crosses.

3. *Crosses 3x x 2x. The trisomics.*

In Plate 3, the origin of eight crosses between hypotriploid and diploid plants is represented. The chromosome numbers in the offspring of these are given in Table I.

In this table a striking difference in distribution of chromosome numbers is apparent, depending on the direction of the cross. In the reciprocal crosses between the diploid and the hypotriploid, the range of chromosome numbers is more limited when the triploid is used as father. This is due to the stronger selection of chromosome combinations among pollen grains than among egg cells. In female gametes the different chromosome constitutions are nearly equally viable. Most of the offspring are aneuploid and represent an extremely wide range of chromosome combinations, as shown in Table II. None of the offsprings is

Table I. Chromosome numbers in offspring of the reciprocal crosses hypotriploid (23) x diploid (16).

Cross	Mother	Father	Number of: capsules	seeds	plants	plants studied	Chromosome number 16	17	18	19	20	21	22	Mean chromosome number
P 54	P 18:14	C.l.	3	61	50	45	1	8	10*	13	5	5	3	
P 55	P 18:11	C.p.	1	17	9	6	—	2	1	3	—	—	—	
Sum	3x-V	2x	4	78	59	51	1	10	11	16	5	5	3	18.80±.21
P 56	3202:20**	P 18:14	1	8	4	4	3	1	—	—	—	—	—	
P 57	"	"	2	29	20	14	6	6	2	—	—	—	—	
P 58	F1-CpCM	"	4	32	21	16	6	5	2	1	—	2	—	
P 59	"	P 18:11	4	39	27	27	8	14	4	1	—	—	—	
P 60	1403:2***	"	6	91	78	73	19	41	13	—	—	—	—	
P 61	1403:3***	"	1	9	9	8	4*	3	1	—	—	—	—	
Sum	2x	3x-V	18	208	159	142	46	70	22	2	—	2	—	16.92±.07

* One plant of these contained a very small centric fragment in addition to the number of chromosomes given.

** No. 3202:20 is a F_1-plant from a cross C.p. x C.M.

*** Nos. 1403:2 and 1403:3 are F_1-plants from a cross C.p. x C.l.

Table II. Detailed chromosome constitution in offspring of the cross of table I.

No. of plants P 54 P 55	No. of plants P 56——P 61	No. of chromosomes in the groups V	L	j	l	i	2n	No. of genetic types
1	46	2	4	4	4	2	16	1
3	12	2	5	4	4	2	17	2
2	13	2	4	5	4	2	17	2
2	24	2	4	4	5	2	17	2
3	21	2	4	4	4	3	17	1
10	70	Sum 2x+1					17	7
		2	6	4	4	2	18	1
2	4	2	5	5	4	2	18	4
	1	2	5	4	5	2	18	4
3	4	2	5	4	4	3	18	2
	1	2	4	6	4	2	18	1
	2	2	4	5	5	2	18	4
	3	2	4	5	4	3	18	2
1		2	4	4	6	2	18	1
4	7	2	4	4	5	3	18	2
10*	22	Sum 2x+2					18	21
2		2	6	5	4	2	19	2
		2	6	4	5	2	19	2
		2	6	4	4	3	19	1
1		2	5	6	4	2	19	2
5		2	5	5	5	2	19	8
3		2	5	5	4	3	19	4
2		2	5	4	6	2	19	2
		2	5	4	5	3	19	4
1		2	4	6	5	2	19	2
1		2	4	6	4	3	19	1
		2	4	5	6	2	19	2
	1	2	4	5	5	3	19	4
1	1	2	4	4	6	3	19	1
16	2	Sum 2x+3					19	35

No. of plants P 54 P 55	No. of plants P 56——P 61	No. of chromosomes in the groups V	L	j	l	i	2n	No. of genetic types
		2	6	6	4	2	20	1
1		2	6	5	5	2	20	4
		2	6	5	4	3	20	2
		2	6	4	6	2	20	1
		2	6	4	5	3	20	2
2		2	5	6	5	2	20	4
		2	5	6	4	3	20	2
		2	5	5	6	2	20	4
2		2	5	5	5	3	20	8
		2	5	4	6	3	20	2
		2	4	6	6	2	20	1
		2	4	6	5	3	20	2
		2	4	5	6	3	20	2
5		Sum 2x+4					20	35
1		2	6	6	5	2	21	2
	1	2	6	6	4	3	21	1
		2	6	5	6	2	21	2
2		2	6	5	5	3	21	4
1		2	6	4	6	3	21	1
		2	5	6	6	2	21	2
1		2	5	6	5	3	21	4
		2	5	5	6	3	21	4
		2	4	6	6	3	21	1
5	1*	Sum 2x+5					21	21
2		2	6	6	6	2	22	1
1		2	6	6	5	3	22	2
		2	6	5	6	3	22	2
		2	5	6	6	3	22	2
3		Sum 2x+6					22	7
		2	6	6	6	3	23	1

* These values are deviating from the equivalent ones in table I because two of the individuals could not be placed in a definite group, due to the presence of structural changes. However, in most of the individuals showing such changes, the chromosome constitution can be determined.

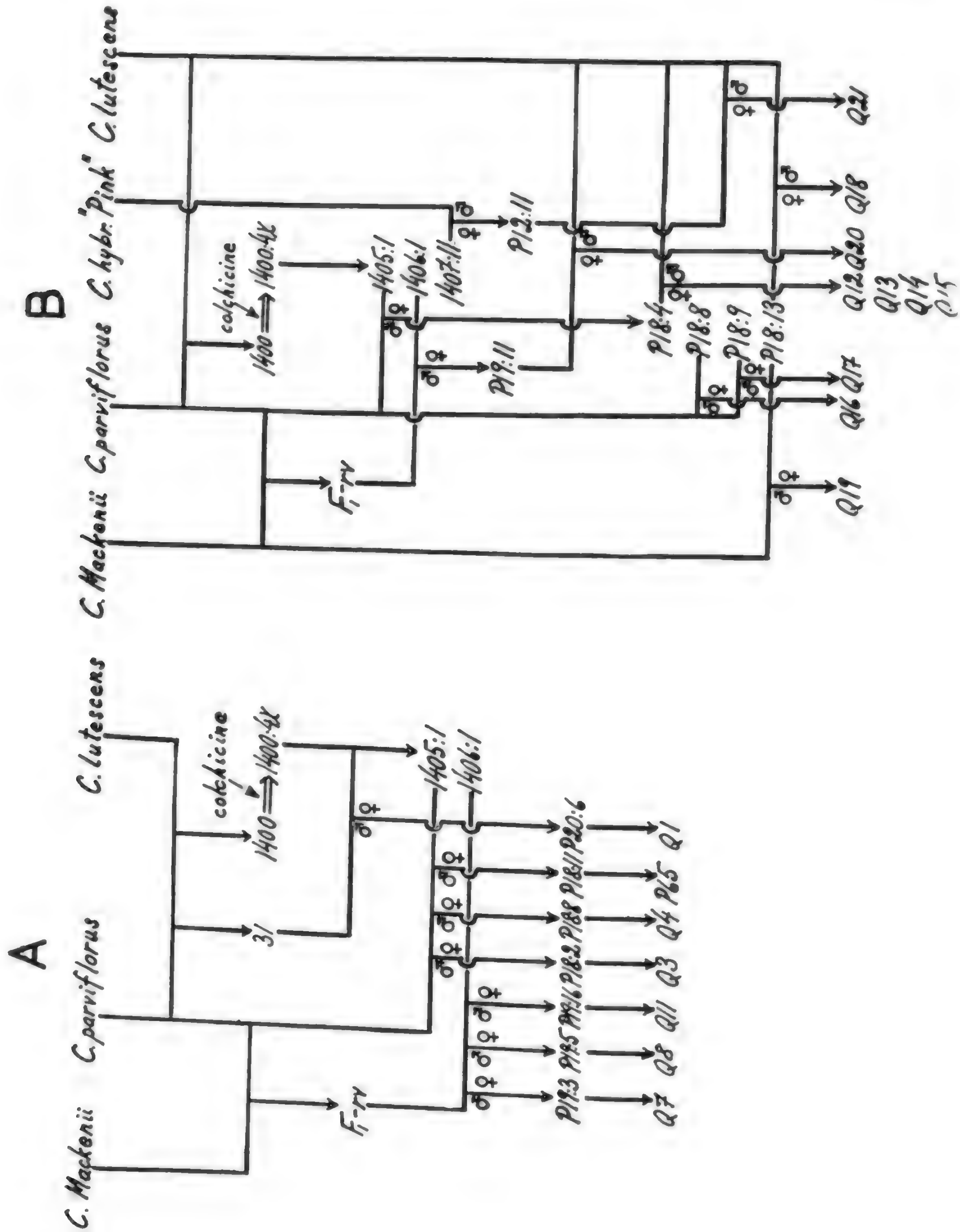

Plate 4. For caption see opposite page.

trisomic for chromosome A. This is because one of the A chromosomes is missing in the hypotriploid parents, which have the constitution 26663.

In the cross diploid x hypotriploid (P56—P61), different extra

Table III. Detailed chromosome constitution in offspring of crosses: 3x x 2x and (3x+j) x 2x.

Plant number	No. of chromosomes V	L	j	l	i	2n	Plant number	No. of chromosomes V	L	j	l	i	2n
3x x 2x							(3x+j) x 2x						
Q12: 5	2	4	4	4	3	17	Q20: 3	3	4	6	5	2	20
8	2	4	4	4	3	17	4	3	4	5	6	2	20
9	3	5	5	6	3	22	5	3	6	6	5	3	23
13	3	5	4	6	3	21	6	2	6	6	4	3	21
14	3	5	5	5	3	21	8	3	5	6	5	3	22
15	3	4	6	5	3	21	10	2	6	5	5	2	20
16	3	6	6	4	3	22	11	3	5	6	6	2	22
Q13: 7	3	6	6	4	2	21	12	2	6	5	6	3	22
11	3	4	4	5	2	18	13	2	5	6	5	2	20
13	2	6	5	5	3	21	14	3	5	6	5	2	21
16	2	4	6	5	2	19	16	2	5	5	5	2	19
Q14: 3	3	6	5	5	2	21	27	2	4	5	4	2	17
7	2	5	4	4	3	18	28	2	5	6	5	2	20
8	2	6	5	5	3	21	—	—	—	—	—	—	—
10	3	6	5	5	3	22	—	—	—	—	—	—	—
12	2	4	5	5	2	18	—	—	—	—	—	—	—
18	3	5	5	5	3	21	—	—	—	—	—	—	—
Q15: 4	2	4	4	6	3	19	—	—	—	—	—	—	—
Sum	46	89	88	88	49	360		32	66	73	66	30	267
No. of plants						18							13
Mean	2.6	4.9	4.9	4.9	2.7	20.0		2.5	5.1	5.6	5.1	2.3	20.5
Exp. mean	2.5	5.0	5.0	5.0	2.5	20.0		2.5	5.0	5.5	5.0	2.5	20.5
3x x 2x													
Q21: 1	2	4	5	4	2	17							
2	2	6	5	6	3	22	(3x-V) x 2x	See Table II.					
3	3	4	5	6	3	21							
4	2	4	5	4	2	17							
5	3	6	6	6	2	23							
6	3	4	4	5	2	18							
7	2	5	4	6	2	19							
8	3	4	5	4	2	18							
9	3	4	5	5	2	19							
10	3	5	5	5	3	21							
Sum	26	46	49	51	23	195		100	244	239	236	122	941
No. of plants						10							50
Mean	2.6	4.6	4.9	5.1	2.3	19.5		2.0	4.9	4.8	4.7	2.4	18.8
Exp. mean	2.5	5.0	5.0	5.0	2.5	20.0		2.0	5.0	5.0	5.0	2.5	19.5

chromosomes are present in the offspring in different frequencies, *viz.*:

Chromosome B or C	16 % (8 % per chromosome)
Chromosome D or E	19 % (10 % per chromosome)
Chromosome F or G	26 % (13 % per chromosome)
Chromosome H	38 %

There is a negative correlation between chromosome size and incidence in trisomics. Very likely, small extra chromosomes will cause

Plate 4. For figures see opposite page.

A. Programme of the crosses given in Table IX.

B. Programme of the crosses given in Table III. *C. hybr. "Pink"* is a diploid of the same chromosome morphology as *C. mackenii,* obtained as a commercial variety from South Africa. The shape of the flowers is about the same as in *C. mackenii,* but the colour is pink instead of white. When the plant is selfed, it is segregating only in pink and white.

less retardation in pollen tube growth than large extra chromosomes. Possibly, there are also differences in pollen viability depending on the size of the extra chromosome.

In another cross, a hypertriploid plant (P19:11) with the constitution 36763 was pollinated with pollen from a diploid plant (Plate 4B). The chromosome formulas of thirteen individuals are presented in the right part of Table III. Only two of them (nos. 13 and 28) have identical chromosome combinations (25652). One plant, no. 27, is a simple trisomic: 2x + j. The mean chromosome number is 20.54, that is about the same as in the parents (20.50). As seen, every plant is trisomic for the extra chromosome of the mother plant.

Table IV. Chromosome numbers in offspring of crosses: ±triploid x diploid.

Type of cross	Chromosome numbers 16	17	18	19	20	21	22	23	24	No. of plants	Mean chr. number	Expected mean	Significance in difference	
(3x-V) x 2x	1	10	11	16	5	5	3			51	18.80±.21	19.50	t=3.35	P<.01
3x x 2x		4	5	4	—	10	4	1		28	19.82±.35	20.00	t= .51	P> .6
(3x+j) x 2x		1	—	1	5	2	3	1		13	20.54±.43	20.50	t= .09	P> .9

Table V. Chromosome loss in triploid meiosis on the female side.

Cross no.	Cross type	No. of plants	No. of chromosomes V	L	j	l	i	Sum
P54,P55	(3x-V) x 2x	50	—	244	239	236	122	841
Q12,Q13,Q14,Q15	3x x 2x	18	46	89	88	88	49	360
Q21	3x x 2x	10	26	46	49	51	23	195
Q20	(3x+j) x 2x	13	32	66	—	66	30	194
	Sum:	91	104	445	376	441	224	1590
No. of chromosomes from the father			41	182	156	182	91	652
No. of chromosomes from the mother			63	263	220	259	133	938
Expected* no. chr. from the mother			61.5	273	234	273	136.5	978
Difference: Expected—Observed			—1.5	10	14	14	3.5	40
Difference / Expected in per cent			—2.4	3.7	6.0	5.1	2.6	4.1

* If 50 % of the gametes have one and 50 % have two chromosome of each type.

Crosses of the type euploid triploid x diploid (36663 x 24442) have also been made. In the offspring of these crosses some individuals were studied. Their chromosome formulas and chromosome numbers are given in Table III. This table also included the mean chromosome numbers of the offspring from the crosses P54 and P55 recorded in Table II. As is seen, the mean chromosome numbers agree very well with the expected values, that is the mean of the parental chromosome numbers.

The distribution of chromosome numbers in the offsprings of ± triploid x diploid are summarized in Table IV. Only in the first cross, there is a significant deviation ($P < 0.01$) from the expected mean. In the second, in which the euploid 3x was used as mother, no individuals with $2n = 20$ have been found so far.

The data of Table III may be used for calculating the chromosome elimination during triploid female meiosis, since the father plants in all

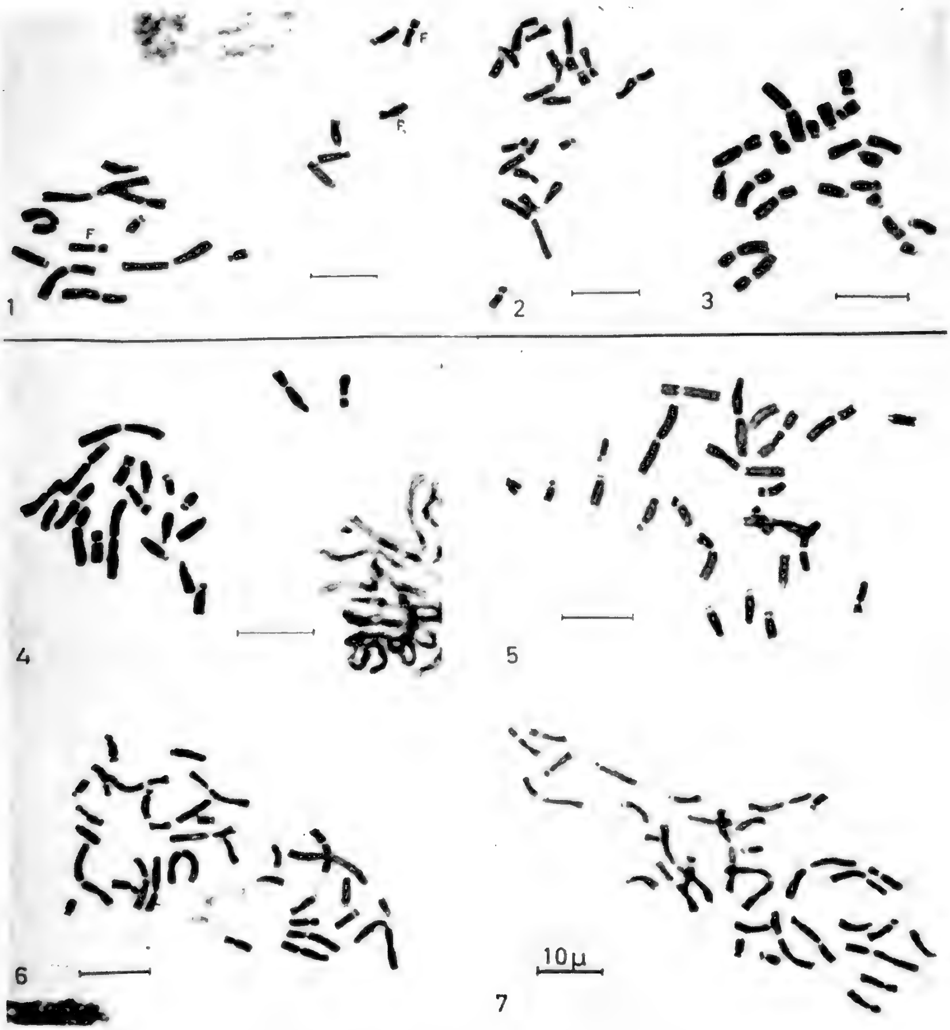

Plate 5. Somatic metaphase plates from:

	Plant no.	2n	Constitution
1.	Q41:5	17	24452 (=2x+F)
2.	P60:51	18	24552
3.	P54:24	20	25553
4.	P54:33	20	25652
5.	P88:8	24	36663 (3x)
6.	P12:2	32	49784
7.	P48:20	32	48884 (4x)

Table VI. Chromosome constitution of offspring from 4x x 2x crosses.

Constitution 2n=	VLjli	No. of plants	Constitution 2n=	VLjli	No. of plants	Constitution 2n=	VLjli	No. of plants	Constitution 2n=	VLjli	No. of plants	Constitution 2n=	VLjli	No. of plants
3x—2	25663	4	3x—1	26663	15	3x	36663	93	3x+1	46663	2	3x+2	38663	1
	26563	1		35663	14	3x+1—1	45663	1		37663	4			
	26653	1		36563	15		37563	1		36763	13			
	35653	1		36653	7		36753	1		36673	6			
	35662	4		36662	4		36672	1		36664	1			
	36562	2	3x+1—2	27653	1		36564	1	3x+2—1	47563	1			
	36652	1		35573	1		35664	1		26674	1			
				35672	1		26673	2						
							27663	2						
Sum		14			58	Sum		103	Sum		28			1

cases contribute 8 chromosomes. A necessary assumption is, that there is no selective viability of the gametes or zygotes. In the cross (3x-V) x 2x, chromosomes of group V are disregarded, as the hypotriploid mother is disomic for chromosome A, and in the cross (3x+j) x 2x chromosomes of group j are excluded because of the presence of an extra chromosome of this group in the hypertriploid mother (Table V).

It appears from Table V, that the mean number of chromosomes eliminated during triploid female meiosis is rather low (4.1%). The mean loss of each gamete is

$$\frac{4.1 \times 24}{100 \times 2} = 0.49 \text{ chromosome.}$$

The tendency of being eliminated varies in the different groups. The highest incidence of elimination is observed in group j. This may be associated with the fact that the chromosomes of this group (D and E) have extremely short arms, which may predispose to a higher tendency of forming univalents. The lowest elimination was found in group V (chromosome A), with its big metacentric chromosomes less likely to form univalents.

Somatic metaphase plates from aneuploid, triploid and tetraploid individuals are shown in Plate 5.

4. Crosses 4x x 2x. The triploids.

Crosses were made between tetraploids and diploids. Usually offspring is only obtained when the tetraploid is used as mother. The chromosome combinations in offsprings of such crosses (48884 x 24442) are given in Table VI.

Nearly all the offsprings in this table originate from a cross between plant no. 1400:4x and C.l. The 204 individuals are classified into 32 chromosome combination types. Half of these individuals (103) have the expected triploid chromosome number 2n=24. Ten of these are actually aneuploid triploids, in which the loss of a chromosome of one group is compensated by the gain of a chromosome of another group (3x+1-1=24). It is probable that even more such compensations are concealed within the chromosome groups L, j or l, which include two different chromosomes each. However, from a theoretical estimation such a probability is less than one in the 93 triploid individuals. The formula for estimating the probability of compensation is given below.

The numbers of individual plants, di-, tri- or tetrasomic for each of the different chromosomes of the complement are given in Table VII. In the case of plants aneuploid for chromosomes of groups L, j or l, the number of individuals is calculated according to the formula shown in the same table. This calculation is based on the assumption that the two chromosome types in each of these groups have the same odds of being in aneuploid condition, i.e. that they behave in the same way in tetraploid meiosis.

Table VII. Frequency of individuals in Table VI, di—, tri—, and tetrasomic for the different chromosomes

Chromosome group	2 (k)	3 (l)	4 (m)	4 (r)	5 (s)	6 (t)	7 (u)	8 (v)	Sum N
V	27	173	4	—	—	—	—	—	204
L	—	—	—	0	27	167	9	1	204
j	—	—	—	0	22	168	14	0	204
l	—	—	—	0	12	180	12	0	204
i	13	187	4	—	—	—	—	—	204

k, l, m, r, s, t, u and v are the absolute frequency of plants for each chromosome condition.

	k	l	m
k	r	$\frac{s}{2}$	$\sqrt{rv}$
l	$\frac{s}{2}$	$t-2\sqrt{rv}$	$\frac{u}{2}$
m	$\sqrt{rv}$	$\frac{u}{2}$	v

$$k = r + \frac{s}{2} + \sqrt{rv}$$

$$l = \frac{s}{2} + \frac{u}{2} + t - 2\sqrt{rv}$$

$$m = v + \frac{u}{2} + \sqrt{rv}$$

27 plants are disomic for chromosome A, 4 are tetrasomic, while the rest (173) are trisomic. The method of calculating the frequency of individuals with regard to chromosome B is given below as an example:

$$k_B = 0 + \frac{27}{2} + \sqrt{1 \times 0} = 13.5$$

$$l_B = \frac{27}{2} + \frac{9}{2} + 167 - 2\sqrt{1 \times 0} = 185$$

$$m_B = 1 + \frac{9}{2} + \sqrt{1 \times 0} = 5.5$$

Under the previous assumption that chromosomes B and C have the same behavior, thus $k_C = k_B$, $l_C = l_B$ and $m_C = m_B$, the incidence of either of these two chromosomes in a dissomic condition is estimated by reduplication of k_B. A summary of these values is shown in Table VIII.

Table VIII. Frequency of triploid individuals, aneuploid for different chromosomes. (In parenthesis: numbers expected from the actual sums of rows and columns.)

	Chromosome	Zygotic condition: Disomic		Tetrasomic		Sum:	
V	A	27	(21.45)	4	(9.55)	31	(18.25)
L	B and C	27	(26.29)	11	(11.71)	38	(36.50)
j	D and E	22	(24.90)	14	(11.10)	36	(36.50)
l	F and G	12	(16.60)	12	(7.40)	24	(36.50)
i	H	13	(11.76)	4	(5.24)	17	(18.25)
	Sum:	101	(73.00)	45	(73.00)	146	

1. $\chi^2 = \frac{28^2}{73} + \frac{28^2}{73} = 21.48^{xxx}$ $p<.001$ $f = 1$

2. $\chi^2 = \frac{12.75^2}{18.25} + \frac{1.50^2}{36.50} + \frac{.50^2}{36.50} + \frac{12.50^2}{36.50} + \frac{1.25^2}{18.25} = 13.34^{xx}$ $p<.01$ $f = 4$

3. $\chi^2 = \frac{5.55^2}{21.45} + \frac{5.55^2}{9.55} + \frac{.71^2}{26.29} + \frac{.71^2}{11.71} + \ldots = 10.38^{x}$ $p<.05$ $f = 4$

From the data of Table VIII, the following points can be discussed:

1. Is there an equal chance of having one chromosome extra or less in the gametic set of the egg cell on the tetraploid level? If the chance is the same, then the disomic and tetrasomic condition of the triploid offspring will be of the same frequency (73:73). However, the observed ratio between the disomic and tetrasomic condition is 101:45. The significant difference between the actual and the expected values indicates the probable loss of chromosomes in the EMC division of the tetraploid plant. The rate of chromosome loss per egg cell can be estimated as follows:

No. of chromosomes expected in the egg cells of 204 individuals = 204 x 16 = 3264.
Observed loss = 101 — 45 = 56.

Loss percentage: $\frac{56}{3264} \times 100 = 1.72\%$.

Loss per egg cell: $\frac{1.72 \times 32}{100 \times 2} = .275$ chromosome.

As seen this figure is much lower than for triploid plants.

2. Is the sum of deviations from the trisomic condition equal for the eight different chromosomes? It was demonstrated by χ^2-test that differences occur among the five chromosome groups ($p<0.01$). These differences are concentrated to groups V (A) and I (F and G); in the former there is a more irregular distribution of the chromosomes, while in the latter there is a more regular distribution than expected.

3. Are the chromosome losses at random in the different chromosome types or is there a varying degree of loss? By χ^2-test the differences found are only significant at the 5%-level. More data are needed to obtain decisive information on this point.

The frequency of plants which are pseudo-euploid triploid can be calculated by means of the following formula:

$$\frac{k_{B}m_{C} + k_{C}m_{B}}{N^2} + \frac{k_{D}m_{E} + k_{E}m_{D}}{N^2} + \frac{k_{F}m_{G} + k_{G}m_{F}}{N^2} = \frac{2(k_{B}m_{B} + k_{D}m_{D} + k_{F}m_{F})}{N^2}$$

(k and m are calculated according to the formulas given in Table VII.)

Thus, the frequency of pseudo-euploid triploids in the 93 apparently euploid triploid individuals given in Table VI can be calculated as follows:

$$\frac{93 \times 2\ (13.5 \times 5.5 + 11 \times 7 + 6 \times 6)}{204 \times 204} = 0.84$$

Consequently less than one per cent (0.90%) of the triploid individuals will be aneuploid in relation to groups L, j and l.

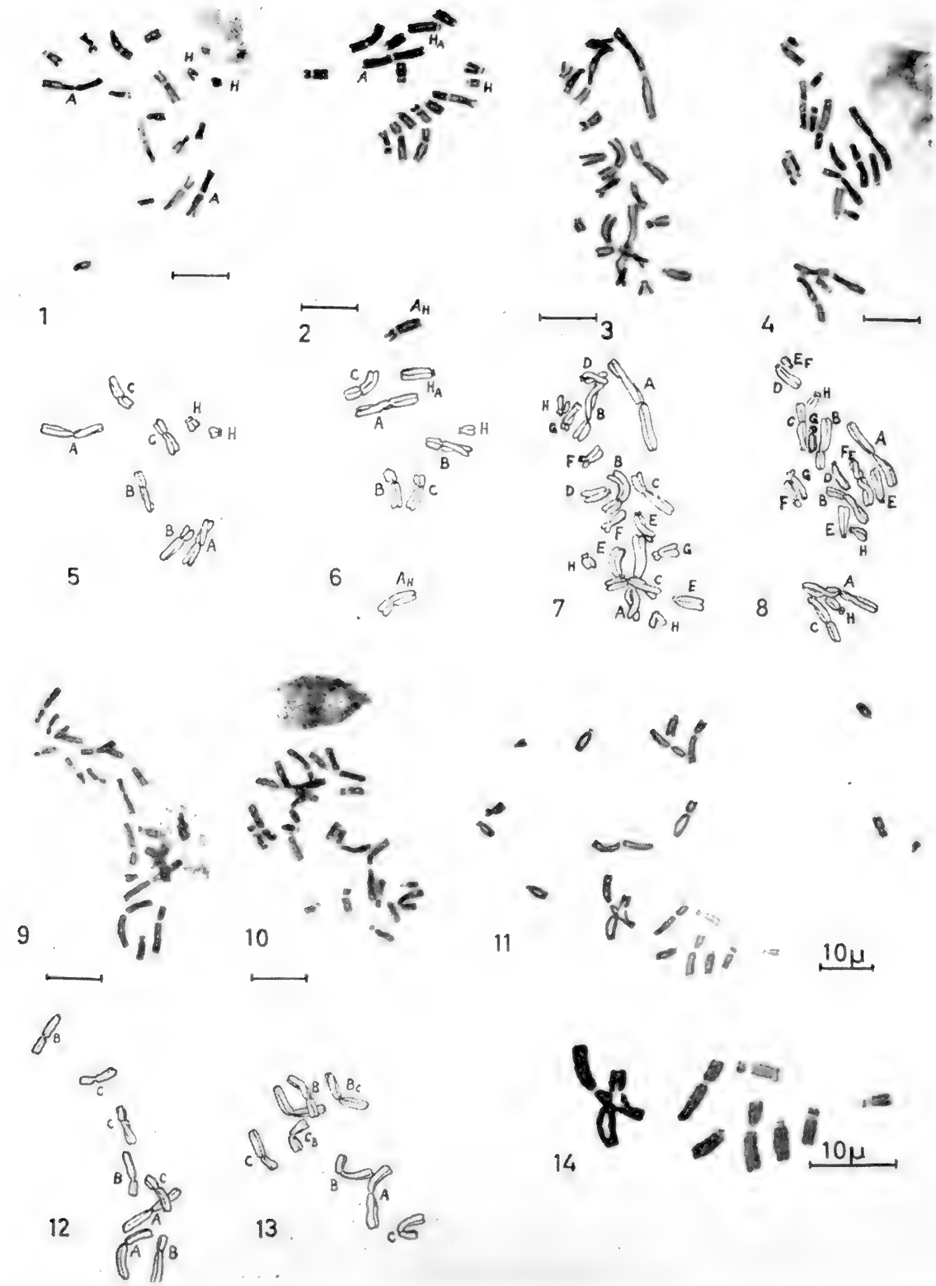

Plate 6. See opposite page for caption.

5. Selfing of triploids and near-triploids.

Some data obtained from selfing one triploid and two hypo-triploid plants are given in Table IX.

Table IX. Chromosome constitution in offspring from one selfed triploid and two selfed hypo-triploids.

Cross number:	P65	Q1	Q8	Q9
Mother plant: *	P18:11	P20:6	P19:5	P19:5
Chromosome constitution of mother plant:	26663	35662	36663	36663
Chromosome constitution of offspring plants:	25553	34452	48874 48864 48663 38674 46783	48684 48783

* The origin of these plants is given in Plate 4A.

Since the material studied is very limited, only restricted conclusions can be drawn. The chromosome numbers of the seven plants obtained after selfing the triploid individual P19:5 are 27, 28, 28, 30, 30, 30 and 31. Thus each of these plants has higher chromosome number than the mother plant (2n=24) and their average number is 29.14 ± 0.39. Probably differential zygotic viability is responsible for the low seed-setting in selfed triploids and for the unexpected distribution of chromosome numbers in the offspring.

6. Structural variation in aneuploids.

During the course of the investigation, several structural chromosome changes were detected. In all 30 individuals out of 511 studied showed at least one translocation or inversion each. As seen from Table X, 29 of these plants were aneuploids and one was triploid. Nine of these 30 individuals were shown to be chimerical, having both normal and translocated karyotypes. Since usually only one or two roots were studied from each individual, it is likely that more of them, perhaps all,

Plate 6. Somatic metaphase plates illustrating the phenomenon of spontaneous structural changes. In order to elucidate the situation parallel drawings of some chromosomes are given.

See opposite page for figures.

Fig.	Plate No.	2n	constitution
1 and 5.	P54:50	17	24452
2 and 6.	P54:50	17	24452, translocation between V and i.
3 and 7.	P58: 3	18	24543
4 and 8.	P58: 3	18	24543, translocation between j and l.
9 and 12.	P54:29	22	26653
10 and 13.	P54:29	22	26653, translocation between L and L.
11.	P19:14	22	26653, chromatid exchange between V and L.
14.	P19:14	22	26653, detail of Fig. 11, enlarged.

Plate 7. Somatic metaphase plates showing small centric fragments.
Fig. 1. Plant no. P56:1 (2x+j) two or three translocations.
Fig. 2. Plant no. P61:4 (2x + small fragment).

are chimerical. The studied plants are still too few to give information about translocation frequency in different trisomics.

Table X. Chromosome number distribution of the plants, which have shown aberrations.

Chromosome number	No. of plants	Plants showing Structural changes	Chimerical
2x=16	56		
17	90	13	7
18	39	3	1
19	23	3	
20	11	1	
21	20	1	
22	25	1	1
23	64	3	
23+1—1	3		
24	99	1	
24+1—1	13	1	
25	32		
25+1—1	2	1	
26	3		
27	1		
28	2		
29	1	1	
30	6		
31	3		
32	10		
32+1—1	3		
33	4	1	
34	1		
Sum:	511	30	9

Three clear cases of structural aberrations in chimerical plants are shown in Plate 6 (Figs. 1-12). Figs. 13 and 14 demonstrate a chromatid exchange between the chromosomes A and B (or C). Small centric fragments are found in some plants. Sometimes they have arisen through mitotic translocation as in plant P56:1 (2x+j). Here the fragment occurred only in the cells of one of the roots studied (Plate 7, Fig. 1). As compared to the chromosomes of another root, two chromosomes of the group j had been replaced by the fragment plus a long chromosome having a median centromere. However, both roots had at least three other chromosomes, which could not be assigned to definite groups. Fragments can be found even in plants showing no other sign of structural changes. Then it is very likely that they have originated in one of the parents. One such case is demonstrated by plant no. P61:4, which has an extremely small fragment in addition to the normal diploid complement. The plant comes from a cross: 2x x (3x-V). Each arm of the fragment is less than one μ long. They are also much slenderer than normal chromosome arms (Plate 7, Fig. 2).

IV. MORPHOLOGICAL RESULTS

Eight morphological characters have been studied quantitatively in relation to the chromosome constitution of the different types of plants. The measurements refer to the first flower and to the longest

leaf of the plant. Plate 8 is a diagrammatic drawing showing the different characters analyzed. The mean values ± standard error for these measurements are given in Tables XI and XII.

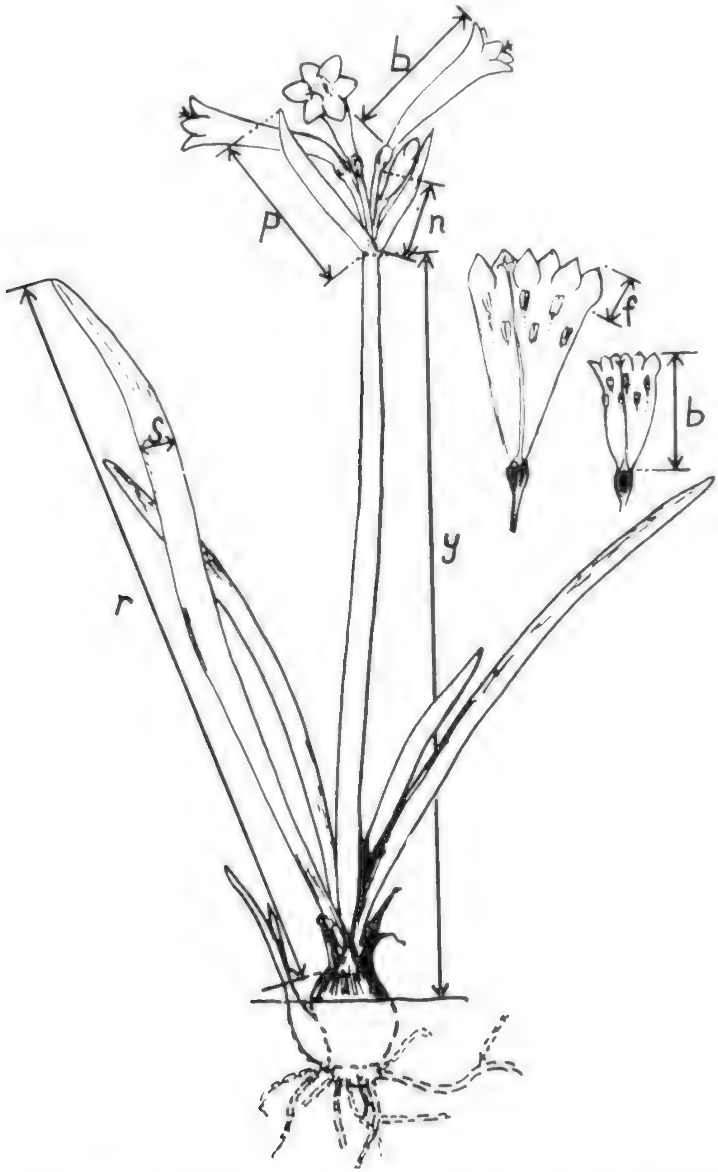

Plate 8. A diagrammatic drawing of an individual plant showing the morphological characteristics taken into consideration. The large and the small dissected flowers represent *C. lutescens* (or *C. mackenii*) respectively *C. parviflorus*.

Table XI. Measurements of morphologic characters in diploid, triploid and tetraploid individuals.

Material	Origin	No. of chromosomes	No. of plants	No. of flowers per peduncle (a)	Length of perianth mm. (b)	Length of perianth lobes mm. (f)	Length of the longest pedicel mm. (n)	Length of the longest spath-valve mm. (p)	Peduncle length mm. (y)	Length of the longest leaf mm. (r)	Breadth of the longest leaf mm. (s)
C. lutescens	C.l.	16	16	5.50±.34	52.13± .33	6.28±.11	20.5± .9	34.7±1.0	384±10	323±19	9.28±.33
2x — F_1	C.p. x C.l.	16	11	7.27±.52	39.64± .91	4.91±.15	19.3±1.5	29.4±4.1	313±17	306±22	6.59±.41
2x — F_2	C.p. x C.l.	16	86	5.23±.17	39.86± .60	5.20±.09	18.6± .6	29.3± .6	273± 8	259± 6	6.75±.14
C. parviflorus	C.p.	16	16	10.75±.54	28.50± .24	3.97±.12	21.9± .8	25.4± .8	339±19	275±12	6.28±.30
2x — F_1	C.p. x C.M.	16	32	7.66±.38	43.59± .70	6.39±.13	22.4± .9	33.7± .9	369±15	283±10	6.30±.25
C. Mackenii	C.M.	16	9	4.44±.38	54.89± .92	7.44±.23	23.1±2.0	34.0±1.8	387±25	391±15	7.67±.36
4x — F_1	C.p. x C.l.	32	1*	6.25	49.00	6.38	20.5	32.5	308	375	9.00
4x — F_2	C.p. x C.l.	32±	50	5.38±.24	48.66± .69	6.47±.14	18.3± .6	29.7± .8	334±12	372±10	9.43±.23
3x — B	4x F_1 x C.l.	24±	83	4.64±.17	48.19± .45	5.57±.07	18.4± .4	29.3± .5	391± 8	350± 7	7.70±.14
3x — B	4x F_2 x C.l.	24±	17	4.76±.44	46.68±1.25	6.09±.21	20.4±1.2	30.1±1.3	323±15	346±13	9.25±.40
3x — B	4x F_1 x C.p.	24±	5	4.80±.92	39.80± .47	4.70±.25	19.6±2.2	27.6±2.2	316± 9	314± 6	8.70±.38
3x — B	4x F_2 x C.p.	24±	17	6.65±.60	39.09±1.07	5.03±.18	20.2±1.2	28.8±1.9	297±21	311±13	8.50±.37
3x — F_2	4x F_1 x 2xF_1	24±	35	6.83±.30	44.84± .84	5.87±.15	21.2± .6	30.0±1.0	386±16	373± 7	8.89±.24

* One individual but four measurements from different inflorescences.

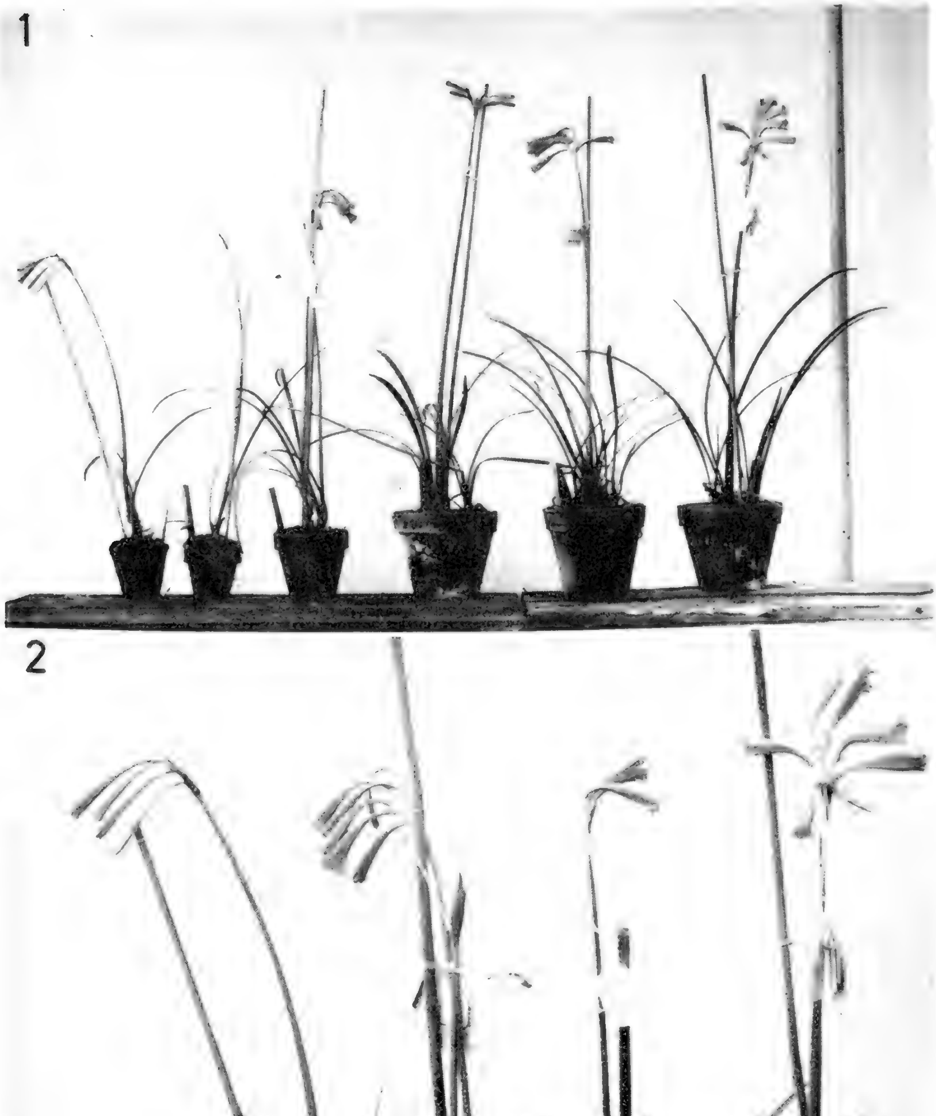

Plate 9. For caption see opposite page.

Because of the nature of the material it has been impossible to keep conditions identical for all plants studied. Thus, some variation has occurred in factors such as age of plant, season of flowering, pot size etc.

The colour of the flower in a certain combination of species depends on the species involved. In *C. parviflorus* it is bright red, in *lutescens* yellow and in *Mackenii* white. Among the tetraploid and triploid plants, some have yellow flowers though the majority has red or yellowish red ones.

As seen from Table XI, clear differences occur between C.p. and C.l. in the number of flowers, length of perianth and length of perianth lobes. The differences in length of spath-valve, peduncle length as well as length and breadth of the leaves are less pronounced. The diploid hybrid is intermediate between the parents in most characters. In peduncle length and in the breadth of the leaves, however, it is very close to C.p. The flowers are larger in tetraploid F_1- and F_2- plants than in the corresponding diploids. Furthermore, the leaves are longer and broader in tetraploid individuals (Plate 9).

The characters of the triploids depend to a great extent on the diploid species used as a father. Back-crossing of the tetraploids to C.l. gives fewer and larger flowers than when crossing with C.p. Crosses of the type: 4x F_1 (C.p. x C.l.) x 2x C.M. have also been made. The offsprings from such crosses which should have a high degree of heterozygosity are under investigation.

In Table XII the measurements taken from the trisomic plants and their diploid sibs are recorded. Due to the small number of these plants only few conclusions can be drawn. It is seen, however, that aneuploids are only slightly reduced in vigour compared with the diploids. Even double trisomic plants are nearly normal in their morphological characteristics (Plate 10).

One of the trisomic types is showing a new morphological trait. As seen in Plate 11, the leaves of the plants, which are trisomic for chromosome C, are much more drooping than those of any other plants. This new morphological character indicates a change of physiologic balance induced by the extra chromosome. Studies are planned to examine whether this action is effected by a few genetic factors in the extra chromosome and in one or two of the other chromosomes, or whether it is the result of many minor factors scattered over the genome. The cross (3x+C) x 2x should yield useful material for this study.

V. SEED-SETTING

It is important to study the fertility of the original species as well as of the different chromosome combinations experimentally obtained.

Plate 9. For figures see opposite page.
Individual plants of the following level of ploidy:

Fig. 1. 2x, P57:10 and *C. lutescens.*
±3x, P12: 6 (26663) and P18:7 (36663).
±4x, P11:18 and P32:24.

Fig. 2. 2x, P57:10.
±3x, P12: 6 (26663) and P18:9 (26653).
±4x, P32:24.

Table XII. Measurements of morphologic characters in diploid, trisomic and double trisomic individuals

Cross number	Constitution	No. of chromosomes	No. of plants	No. of flowers per peduncle (a)	Length of perianth mm. (b)	Length of perianth lobes mm. (f)	Length of the longest pedicel mm. (n)	Length of the longest spath-valve mm. (p)	Peduncle length mm. (y)	Length of the longest leaf mm. (r)	Breadth of the longest leaf mm. (s)
P56,P57,P58	2x	16	11	6.36±.28	44.18±1.53	5.55±.20	26.3±2.1	34.3±1.6	417±25	370±14	7.77±.28
P59	2x	16	6	6.67±.71	39.00±1.10	5.75±.21	26.2±4.6	29.0±3.2	337±43	302±10	7.50±.32
P60,P61	2x	16	9	7.11±.72	38.50± .98	5.33±.28	18.8±1.2	27.9±1.3	307±24	307±24	8.00±.42
P56-P61	2x	16	26	6.69±.31	41.02± .92	5.52±.13	23.6±1.4	30.8±1.2	360±12	332±12	7.79±.20
P56-P61	2x+i	17	11	7.45±.37	36.27±1.19	5.55±.30	22.6±2.0	35.8±3.4	387±28	356±18	7.73±.33
P56-P61	2x+l	17	12	6.67±.51	35.29±1.30	5.33±.28	22.4±1.8	28.3±1.2	308±21	301±12	7.08±.29
P56-P61	2x+j	17	4	7.00±.41	34.00± .71	4.88±.13	19.8±3.0	27.8±1.9	315±47	293±25	8.38±.72
P56-P61	2x+L	17	5	6.80±.97	39.30±2.15	6.30±.58	18.2±1.8	32.8±4.3	294± 7	276±19	6.90±.62
P56-P61	2x+1	17	32	7.00±.27	36.09± .75	5.50±.18	21.5±1.1	31.5±1.5	334±18	315±10	7.44±.21
P56-P61	2x+2	18	12	5.67±.76	34.38±1.21	5.58±.36	18.3±1.8	28.3±1.9	310±37	315±16	7.21±.41

As the number of aborted embryos per capsule has not been counted, it is not possible to give exact data on fertility. The seed-setting has been recorded, however, and it may be expected to be strongly correlated with fertility. The seed-setting, i.e. number of seeds per capsule is recorded in Table XIII. There are differences in seed-setting between the three species. The mean value for C.l. is 35.85 seeds per capsule, for C.p. 26.72

Plate 10. Diploid and aneuploid individual plants of the following constitution: (from left to right)

P 57:10	(24442)	2x
P 58:17	(24442)	2x
P 58: 1	(24443)	2x+i
P 58: 9	(24443)	2x+i
P 58:13	(25542)	2x+L+j
P 60:24	(25452)	2x+L+l
P 54:40	(25462)	2x+L+l+l
Q 21: 7	(25462)	2x+L+l+l
P 54:13	(26553)	2x+L+L+j+l+i

and for C.M. 17.23. The hybrid between C.p. and C.l. has a lower value than in the parents viz. 22.33, and the hybrid between C.p. and C.M. has nearly similar value (21.47). Most probably the reduced seed-setting in the clone of C.M. is due to a special genotypic constitution. This is shown by the fact, that when pollinated with pollen from other species it gives usually many more seeds per capsule. Segregation of genetic factors may also be responsible for the low seed-setting in F_2-plants of C.p. x C.l. Another possibility is that the low rate of seed-setting in F_1- and F_2- plants is due to the presence of chromosome G in a heterozygous condition.

Table XIII. Seed-setting after selfing or intercrossing of diploid, triploid and tetraploid individuals.

	Number of seeds per capsule: 0	1 —	5 —	10 —	15 —	20 —	25 —	30 —	35 —	40 —	45 —	50 —	No. of capsules	Seed per capsule m	$\pm \frac{s}{\sqrt{n}}$	No. of Capsules per flower
2x selfed:																
C. parviflorus			7	9	26	21	17	29	15	7	3		134	26.72	.84	
C. lutescens				1	5	5	19	22	27	19	8	5	111	35.85	.82	
C. Mackenii			2	19	16	10	1						48	17.23	.64	
C. hybr. Pink			2	6	4	2	1						15	16.07	1.50	
2002:11 *		1	3	2	2	7	6	7	1	4	1		34	26.59	1.87	.78
F_1CpCl		1	15	39	30	29	20	13	10	6	5	1	169	22.33	.82	
F_1CpCl1		1	10	21	32	17	28	8	8				125	21.47	.74	
F_2CpCl		19	61	84	61	36	27	20	12	6	1	1	328	17.64	.54	
4x selfed:																
F_1CpCl		3	7	11	5	1							27	11.70	.94	
F_2CpCl		23	23	26	6	1							79	9.24	.52	
other 4x		22	17	10	4								53	7.51	.60	
4x x 4x (crosses)		17	30	11	8	1							67	8.78	.59	
Sum 4x		65	77	58	23	3							226	8.99	.32	.66
3x selfed:																
(4x F_1 x Cp)		7	1										8	3.75	.72	
(4x F_1 x Cl)		1	3	1									5	7.40	1.96	
other 3x		48	39	5									92	5.74	.29	
3x x 3x (crosses)	1	5	4										10	4.44	1.00	
Sum 3x	1	61	47	6									115	5.56	.26	.18
2x x 4x:	62	17	2										81	.59	.17	.42
4x x 2x:																
4x F_1 x 2x			2	4	4	3	7	4	2	—	—	1	27	24.78	1.94	
4x F_2 x 2x	1	3	8	15	18	16	9	12	4	4	—	4	94	23.13	1.22	
other 4x x 2x		7	7	5	10	8	3	2	1				43	16.16	1.37	
Sum 4x x 2x	1	10	17	24	32	27	19	18	7	4	—	5	164	21.57	.88	.75
2x x 3x:																
Cp x 3x		16	11	1	2	—	1						31	7.35	1.04	
Cl x 3x		6	4	4									14	7.50	.92	
other 2x x 3x	3	14	23	13	6	2	1	—	1				63	9.78	.86	
Sum 2x x 3x	3	36	38	18	8	2	2	—	1				108	8.79	.60	.26
3x x 2x:																
(4x F_1 x Cp) x 2x		3	5	6	1	2							17	11.59	1.46	
(4x F_1 x Cl) x 2x		2	6	16	7	2	1	1					35	13.91	1.06	
other 3x x 2x		22	60	39	36	23	15	5	2	2	1		205	14.98	.62	
Sum 3x x 2x		27	71	61	44	27	16	6	2	2	1		257	14.61	.53	.47
4x x 3x		19	16	7									42	6.43	.56	.26
3x x 4x	6	47	12										65	3.45	.28	.28

Table XIV. Seed-setting in single trisomics and their diploid sibs.

	Number of seeds per capsule											No. of	Seeds per capsule		No. of
	0 — 5	— 10	— 15	— 20	— 25	— 30	— 35	— 40	— 45	— 50	—	capsules	m	$\pm \sqrt{\frac{s}{n}}$	capsules per flower
2x selfed:															
P54,P55							2					2	31.50		
P56,P57,P58		1	5	1	11	6	2	3	3	3		35	27.71	1.84	
P59		3	3	7	8	5	5	1	1			33	22.94	1.48	
P60,P61		3	6	8	7	6	3	2				35	21.46	1.41	
2x x 2x crosses				3	4	2	4	5	—	—	1	19	29.95	2.19	
Sum:		7	14	19	30	19	16	11	4	3	1	124	25.08	.88	.653
2x x (2x+1):															
L		5	4	6	14	8	4	1	3	1		46	23.46	1.47	
j		1	—	1	—	1						3	17.00	5.51	
l		4	3	11	13	20	8	9	4	9	2	83	29.59	1.23	
i	1	1	4	10	4	9	2	7	3	3		44	27.02	1.76	
Sum:	1	11	11	28	31	38	14	17	10	13	2	176	27.13	.85	.725
(2x+1) x 2x:															
L	1	2	4	3	5	3	1	1				20	20.30	1.95	
j	1	—	1	1	2	—	1	1				7	21.57	4.41	
l	2	2	4	10	12	7	4	2	1	1		45	22.80	1.40	
i	1	4	10	8	11	7	4	1				46	20.17	1.21	
Sum:	5	8	19	22	30	17	10	5	1	1		118	21.80	.82	.641
(2x+1) selfed*:															
L	2	2	4	3	2	2	1	1				17	17.47	2.58	
j		1	1	1	3	1						7	19.57	2.58	
l	3	11	11	7	17	1	1	2				53	17.28	1.06	
i		7	18	11	8	4	1	—	2			51	17.75	1.13	
Sum:	5	21	34	22	30	8	3	3	2			128	17.62	.72	.688

* Even crosses in which the two plants are of the same trisomic type are included here.

The seed-setting after selfing of tetraploid plants is reduced by 50 per cent as compared with the seed-setting on the diploid level. That this is not due to a lower number of embryos per capsule is shown by the fact, that when the tetraploids are pollinated with haploid pollen, their seed-setting is about the same as in diploid plants.

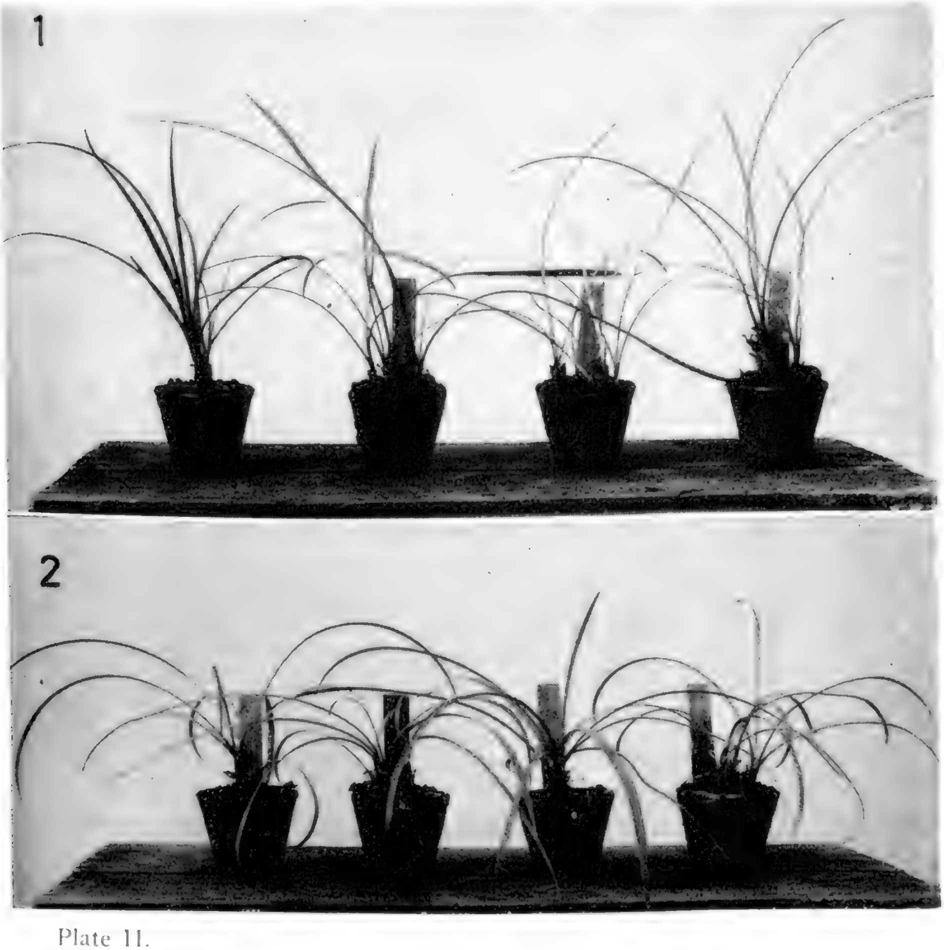

Plate 11.
Fig. 1. Individual plants trisomic for chromosome B (L).
Fig. 2. Individual plants trisomic for chromosome C (L).

Diploid plants, when pollinated with pollen from triploids give less than one half of the normal number of seeds. This is most probably due to high embryo mortality. In the reciprocal direction the cross has a higher seed-setting in spite of producing a much higher frequency of imbalanced offspring plants (See Table I). Thus, the embryo mortality in 2x x 3x crosses must depend largely on interaction between embryo—endosperm or between embryo—mother plant.

The seed-setting is very low both in tetraploid x triploid and triploid x tetraploid crosses. This is surprisingly different from the high seed-setting of diploid x triploid and triploid x diploid crosses. The reason even in this case may be an interaction between embryo, endosperm and mother plant.

A few seeds were obtained after pollinations of diploid plants with pollen from tetraploids. Usually such seeds do not germinate. A few plants have come through, however, but they have not yet been examined with respect to chromosome number. In crosses of this type, capsules of nearly normal size are often formed, but containing only thin, apparently empty seeds.

The data presented in Table XIV gives an idea of the seed-setting in trisomic plants. The seed-setting after selfing is

$$\text{about } 70\% \ \frac{(17.62)}{(25.08)}$$

and after crossing with diploids about 87%, of normal diploid seed-setting. Diploids pollinated with pollen from trisomics have about normal fertility.

VI. DISCUSSION

Two points of specific interest will be discussed here. The first one is the high tolerance to aneuploidy shown by *Cyrtanthus*. Such a tolerance, also found in *Hyacinthus* (Darlington and Mather 1944; Darlington, Hair and Hurcombe 1951), was ascribed to a special kind of intra-chromosomal balance in this plant. It was demonstrated that: "unbalanced multiples of the chromosome set were as satisfactory or nearly so, as the balanced multiples, thus indicating that each chromosome was internally balanced to an unusual extent." This theory was confirmed by the fact, that only two varieties of *Hyacinthus* out of 106 studied had visible structural changes. Darlington (1956) gives one more example of internal chromosome balance, viz. *Narcissus bulbocodium*, stating: "Having a *Hyacinthus*-like disregard of balance it also fills the whole range from 2x to 3x, and has up to four heterochromatic B-chromosomes as well." A similar tolerance is found in some other plants. Aneuploids of *Sorghum vulgare* (Price and Ross, 1957) and of *Collinsia heterophylla* (Dhillon and Garber, 1960) show only a slight reduction in vitality as compared to diploids. In *Collinsia* even heptasomic plants (2x+5) have been reported. *Cyrtanthus* has at least the same degree of tolerance to aneuploidy as *Hyacinthus*. The spontaneous structural changes in aneuploid *Cyrtanthus* plants, if propagated, will constitute an especially interesting material for testing the theory of intra-chromosomal balance.

The origin of the structural changes in *Cyrtanthus* is the second point of interest. As the aneuploid individuals are all descendants of the same amphidiploid individual (no. 1400:4x), they are also heterozygous for many loci. Structural heterozygosity is only revealed in chromosome G. This does not mean, however, that structural differences are not present in the other chromosomes. Minor changes as well as

exchanges of equal parts will escape detection in mitosis. Therefore it cannot yet be excluded that somatic inter-chromosomal pairing can be the reason for the spontaneous structural changes found. Then, however, they will be equally frequent in the heterozygous diploid individuals as well.

A second, more likely explanation, is that the aneuploid condition in some way causes chromosome instability. Giles (1941) found a high frequency of breakage in meiosis and pollen mitosis of triploid hybrid *Tradescantia* as compared with the diploid and tetraploid parents. He ascribes this increase of spontaneous chromosome breakage in part to the hybrid condition and in part to chromosomal unbalance of the pollen grains. In the root tip mitosis, however, there were no differences in frequency of bridges and fragments. The frequency was very low: 0.025% aberrations per chromosome.

Nichols (1941) studied spontaneous chromosome aberrations in root tip cells of *Allium cepa.* He found a high frequency of breakage in root tip cells of germinating seeds and five months old seedlings (about 0.125% chromatid aberrations per chromosome). In root tips from onion bulbs, however, not a single aberration was found in 600 cells analyzed. Nichols writes: "This rather surprising result must mean that the conditions in the bulb are less conducive to chromosome breakage and rearrangement than in seedlings and in young plants."

Brock (1955) reported spontaneous chromosome breakage and spindle abnormalities in endosperms of *Hyacinthus orientalis.* Numerically unbalanced endosperms had a high frequency of breakage, sometimes causing endosperm failure and embryo abortion.

Rutishauser (1956) describes spontaneous chromosome breakage in the endosperms of *Trillium grandiflorum.* In root cells no aberrant chromosomes were found. The presence of fragment chromosomes raises the breakage frequency. From his results, Rutishauser concludes that the spontaneous chromosome breakage is genetically controlled.

The trisomics of *Datura* have a tendency to produce unrelated types of extra chromosomes in the offspring. Such types are produced in a different frequency by different trisomics (Blakeslee and Avery, 1938; Darlington, 1906). According to Blakeslee and Avery, "Primaries throw an average of .86 per cent new mutants; secondaries an average of .62 per cent. Both form better mutation machines than do 2n parents which throw .16 per cent new trisomics" . . . "Why the presence of one extra chromosome increases the chromosomal mutation rate is not clear. The increase is perhaps in some way caused by interference with meiotic divisions."

Fragment chromosomes have been reported in the progenies of aneuploids of *Datura stramonium* (Blakeslee and Avery, 1938), maize (Mc Clintock, 1929), wheat (Sears, 1954) and barley (Tsuchiya, 1959). Whether these are caused by mitotic or meiotic disturbances is not clear.

Spontaneous structural changes of somatic chromosomes have been described even in the diploid offspring of trisomic *Crepis.* Navashin (1931) studied the offspring from two trisomic plants and from one

aberrant plant possessing a very small spherical fragment in addition to t..e normal chromosome complement. Out of ten morphol gically abnormal plants, three (one from each parental plant) turned out to be chimerical for structural changes. These three were all diploid. Navashin writes (p. 204): "It seems probable that there exists some peculiar condition in certain individuals, which makes their chromosome structure and the chromosomal distribution labile and subject to frequent alterations in various ways." He suggests that "some heritable instability of chromosome behaviour" was present in the actual material. It is interesting to see that these plants were morphologicaly abnormal in spite of being diploid. Maybe something had happened to the chromosomes already in the preceding generation, even if they looked normal. Unfortunately meiosis was not studied.

VII. SUMMARY

A cyto-genetic investigation of the genus *Cyrtanthus* has given the following preliminary results:

(1) The chromosome number 2n=16 was determined for six *Cyrtanthus* species and for the related *Vallota speciosa.*

(2) The chromosome morphology shows great clarity and distinctness, permitting secure identification of five chromosome types.

(3) A tetraploid (amphidiploid) strain was started by colchicine treatment of a diploid specific hybrid.

(4) An abundant material of individuals with different chromosome numbers was produced by crossing. For each plant, the exact combination of the five chromosome types (see 2. above) was determined. Among the about 500 individuals thus analyzed, 84 distinct karyotypes were described.

(5) While there was no indication of structural instability in normal diploids, 30 cases of spontaneous aberrations have been observed, 29 of them in aneuploid plants.

(6) A number of morphological traits was measured and correlated with chromosome constitution. *Cyrtanthus* is characterized by a remarkably high tolerance to aneuploidy.

(7) Seed-setting was analyzed in relation to polyploidy and aneuploidy.

Acknowledgements.—I wish to express my gratitude to Mr. G. McNeil, N. Transvaal, South Africa, and to Dr. B. Peterson, Gothenburg, Sweden, for providing some of the materials for this investigation. I am also very much indebted to Drs. W. K. Heneen and G. Oestergren, Institute of Genetics, Lund, Sweden, for the cytologic technique, and for the composition of the fixative, respectively, and for their permission to mention their method here. I should like especially to thank Prof. A. Levan, Institute of Genetics, Lund, Sweden, for stimulating discussions and for critical reading of the manuscript.

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NEMATODES ON HEMEROCALLIS

It is our sad duty to report that nematodes on *Hemerocallis* in the East and South have become a menacing pest that may present a great problem to all who grow daylilies. All who order plants should specify that they must be nematode-free.

[NEW AMARYLLIS HYBRIDIZERS, B. D. Smith, continued from page 94.]
is also working with many species which she is crossing with the Dutch hybrids. These include work with *A. johnsonii*, *A. striata*, Dr. Nelson's *A. belladonna* and others. At this nursery you will find many thousands of outstanding hybrids. Mrs. Barry has already originated clones from crosses such as 'Salmon Joy' x Bouquet, 'Champion's Reward' x 'American Express', and many of the Dutch named clones in red, pink and white. The writer has been fortunate to obtain some of Mrs. Barry's hybrids to run trials on in the north Georgia area. Since a number of these bulbs are new originations, I am looking forward avidly to bringing them to bloom.

We welcome all of these growers, as it is through their efforts, and others who are experimenting with and originating new strains of *Amaryllis*, that we will be able to obtain more beautiful *Amaryllis* in future years.

[PLANT LIFE LIBRARY, continued from page 72]

PHYSIOLOGY OF PLANTS, by P. Font Quer. Harper & Brothers, 49 E. 33rd St., New York 16, N. Y. 1960. Illus. pp. 128. $2.25. This concise text by an outstanding authority discusses the subject of plant physiology under seven sections —the functions of water, the chemistry of plants, growth, multiplication and reproduction, genetics, hereditary characters, and plant movements.

GARDENS IN WINTER, by Elizabeth Lawrence. Harper & Brothers, 49 E. 33rd St., New York 16, N. Y. Illus. pp. 218. $4.50. In the past, Miss Lawrence has favored us with two delightful books—"A Southern Garden" and "The Little Bulbs"—which were briefly reviewed in these columns, and now another charming book from her pen has arrived. It is doubly outstanding because Miss Caroline Dormon has contributed the artistic drawings. The book is filled with garden lore concerning the winter garden, a subject so much neglected in the United States. Although Miss Lawrence writes from the haven of her North Carolina garden, she includes references to the gardening experiences of others known to her through correspondence. This outstanding gardening book is highly recommended to all.

THE ENCYCLOPEDIA OF THE BIOLOGICAL SCIENCES, edited by Peter Gray. Reinhold Publ. Corp., 430 Park Av., New York 22, N. Y. 1961. Illus. pp. 1119. $20.00. This outstanding new reference work, international in scope, containing an abundant harvest of up-to-date information about the biological sciences, fills a definite need and will be welcomed. The articles are concise, yet they are inclusive enough to present the subject properly. As an example of the originality of the work, it should be noted that the contributions of Michel Adanson to science are given adequate coverage for the first time in any encyclopedia. This stimulating authoritative survey of the biological sciences is indispensable to all biologists. It cannot be recommended too highly.

ENCYCLOPEDIA OF MICROSCOPIC STAINS, by E. Gurr. Williams & Wilkins Co., Baltimore 2, Md., exclusive U. S. agents. 1960. Illus. pp. 498. $10.50. This authoritative book is intended as a reference work and a laboratory guide on the applications, structures, composition, molecular weights and properties of a very large number of dyes and other substances used for staining microscopic tissue preparations, etc. In Sect. I, stains, indicators, etc., are arranged in alphabetical order; in Sect. II, dyes and indicators are arranged in order of ascending molecular weights; in Sect. III, diazonium and tetrazonium salts (stabilized) are listed with structures and molecular weights; and in Sect. IV, tetrazolium salts and formozans are listed. Highly recommended.

MORPHOLOGY OF THE ANGIOSPERMS, by A. J. Eames. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1961. Illus. pp. 518. $13.50. This comprehensive text on all phases of the morphology of the angiosperms by an outstanding authority was written for the teacher and advanced student. The text incorporates recent advances, and emphasizes evolutionary modifications and phyletic implications. After considering the plant body as a whole, chapters are devoted to the inflorescence, the flower, the androecium and stamen, pollen, gynoecium, the ovule, archesporium, fertilization, and seed and fruit. The book concludes with chapters on the morphology of selected families, and a discussion of the phylogeny of angiosperms. Highly recommended.

FUNDAMENTAL PRINCIPLES OF BACTERIOLOGY, by A. J. Salle. 5th ed. McGraw-Hill Book Co., 330 W. 42nd St., New York 36, N. Y. 1961. Illus. pp. 811. $11.00. This 5th edition of an outstanding text incorporating recent advances in bacteriology will be generally welcomed. The text was written for beginning students who plan to major in bacteriology, microbiology and related fields—public health, sanitary engineering, nursing, optometry, agriculture, etc. The book is sufficiently broad to provide the needed sound grounding. In the presentation, the use of chemistry, for a clearer understanding of the composition of bacteria and the reactions they produce, is emphasized. Two new chapters—"Bacterial Genetics" by W. R. Romig, and "Bacteriology of the Sea", by C. E. ZoBell, have been added. The text is highly recommended.

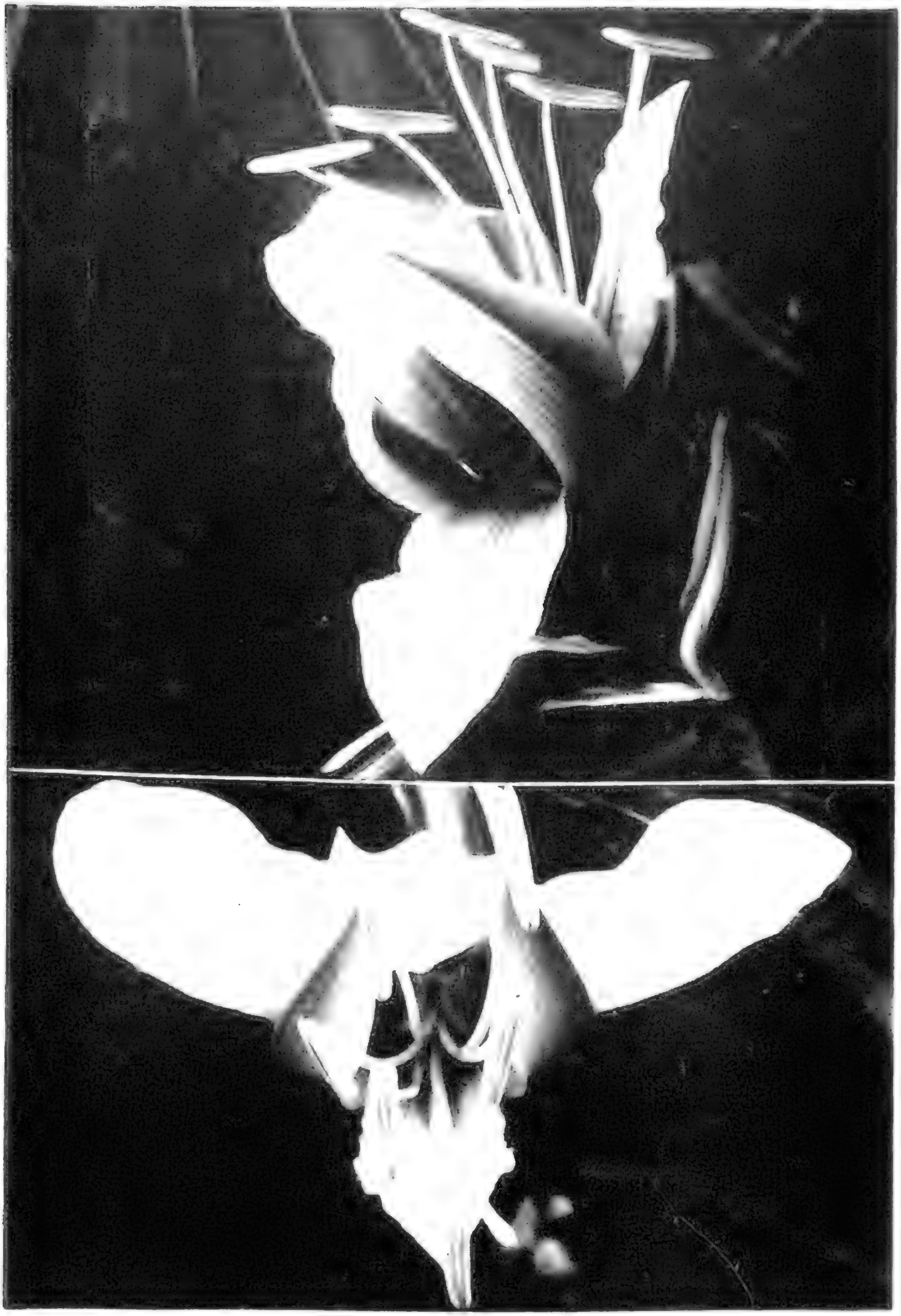

Fig. 19. *Amaryllis calyptrata*, one of the "Green Amaryllis," as grown at the Los Angeles State & County Arboretum, Arcadia, Calif. Photo by Jack V. McCaskill.

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

GROWING OF **AMARYLLIS CALYPTRATA** IN CALIFORNIA

W. Quinn Buck,
Los Angeles State and County Arboretum, Arcadia

In early October of 1958, the Arboretum received several kinds of exotic seed from Mrs. E. G. McGhee of Sao Paulo, Brazil. One of the packets contained seed of *Amaryllis calyptrata*, an epiphytic Brazilian species that we had not had before.

On October 9, 1958, these seed were planted in an open, humus compost, and germination began in two weeks. On November 3rd, thirty small seedlings were put into three-inch pots in a fairly rich potting mixture. Growth was quite rapid, and on June 1, 1959, they were shifted into six-inch pots. By May 12, 1960, they again were shifted, this time into nine-inch pots. Growth continued to be rapid, and the plants were becoming handsomer and more impressive.

At almost exactly two years of age the first of these *Amaryllis calyptrata* seedlings bloomed, sending up a strong spike at the side of its huge bulb. The buds opened slowly, becoming two clear green flowers of most unusual shape and of very heavy substance [Fig. 19]. The narrow petals were flaring, whereas the sepals arched inward and almost touched. The flowers were short-lived, and no pods resulted from self-pollination.

No more spikes appeared until May of 1961. The second bulb produced a two-flowered spike almost exactly like the first. This time two pods were set after self-pollination, and good seed filled the pods when they finally ripened after two months. Pollen put on the white hybrid 'Nivalis' gave a few viable seed, and pollen stored for ten days and then used on Ludwig's 'Dazzler' gave two good pods of viable seed.

Interestingly, the pods matured on the whites in exactly a month, and the seed had already germinated before the selfed pods on the *Amaryllis calyptrata* parent were ripe.

The third spike again was a duplication in form and color. The fourth, late in July, 1961, however, was different in both. The color was a soft, creamy green, with real pink and orange brightening stamens and pistils. In this clone the sepals did not arch inward but stood almost straight up, giving a more typical flower shape. This, the best of the ones to flower, set no seed.

Other spikes are now appearing, and No. 2 is sending up its second and third spike for the year. The flowering season in our latitude has not become set, but it appears that the fall might account for more of the spikes.

We hope to be able to combine characters from desirable clones in working for improved form and color in this species. The crosses with

whites will be extremely interesting to watch; these small seedlings are starting off vigorously and encouragingly.

Growing this species in the greenhouse has given large, handsome plants and monster bulbs quickly, and it has aroused our interest for continuing with it.

AMARYLLIS STRIATA NATURALIZED IN HAWAII

HOWARD F. COOPER, *Hana, Maui, Hawaii*

The time of arrival of *Amaryllis striata* in Hawaii is apparently lost in the hazy past; most likely it was brought in by the early European or American settlers. It is obvious, however, when one observes these plants growing in abandoned home lots, and particularly in neglected graveyards, that this species has found a congenial home in Hawaii. This species seems to thrive on abuse, and though it apparently does not seed naturally under prevailing conditions in the vicinity of Hana, it does seem to maintain itself without difficulty and to spread gradually by offsets which are formed in great abundance. [Editorial note.—Cut flower scapes of *Amaryllis striata* sent for identification by Mr. Cooper to the writer by air mail arrived in good condition, and when self-pollinated, and placed in water, produced seeds.—*H. P. Traub*] The plants seem to prefer partial shade and rocky soil conditions. Flowering is increased however as the shade is removed. Bulbs will send up several scapes during the year—mostly in February and June. Scattered flowers are present at any time of the year.

I have found in my short experience with *Amaryllis* that the species, *A. striata*, makes an ideal seed parent with pollen from other *Amaryllis* species. Many crosses with Dutch hybrids have been made to date but as these seedlings are not yet a year old, no blooms have been obtained. It will be interesting to see how they turn out.

As a border planting, few plant species can compete with this prolific flowering *Amaryllis*. When hundreds of *A. striata* are seen in bloom at once, without any human care or attention—it is a sight to see indeed.

1960-61 AMARYLLIS SEASON — HYBRIDS AND SPECIES

ROBERT D. GOEDERT, *Florida*

The 1960-61 season ushered in new trends in *Amaryllis* hybridizing and a marked interest particularly in those hybrids and species suitable for the border. As evidenced by the new introductions, the Dutch hybridizers show more interest in the blends, bitones and stripes. New forms are also being introduced. This is a refreshing departure from the solid colors formals that have been the vogue for many years. It will, in my opinion, lend character to the named clones in the future, and I feel, will create much more interest in the culture of *Amaryllis*.

It will make distinctive individuals of many of the named clones and one will not have to read the name tag to identify the clone.

Many northern gardeners are learning that *Amaryllis* are very worthwhile border plants. They are finding by growing *Amaryllis* in the border, they can maintain a large collection quite easily. The bulbs are dug each fall and stored in the basement or other place at about 50 degrees F. until planting time in the spring.

Many *Amaryllis* enthusiasts in the South are purchasing more of the small size Dutch hybrids and find they establish themselves more readily in the border than the mature bulbs. In this regard, the 20/22 cm. size in white will normally give a fair flower spike but in the other colors, one should possibly purchase the 22/24 cm. size if flowers are wanted the first season. *Amaryllis* fans have concerned themselves mostly with the show flower types in the past and the hybridizers have practically totally neglected further development of those suitable for the border. This is very regretful. Any awaking to this need would surely make these magnificent flowers more popular. Many of the show varieties are not suitable border plants. The flower is too heavy, they don't flower as freely as they should and they are more exacting in the requirements than they should be for this border use.

Before I discuss the named clones, I would like to touch on some of the unnamed hybrid strains that are available. The Hadeco Strain Amaryllis from South Africa increased in popularity last season. These bulbs, being grown in the southern hemisphere, are available from about the middle of September on, and can easily be flowered in 5 to 6 weeks. At present they are available in mahogany red (orange red), violet red, wine red, rose, pink, and white line pink. Named clones of this strain will be tested during the 1961-62 season and should make their appearance on the American market in two to three years. They were developed by crossing the Dutch Strains on certain hybrids that had naturalized in South Africa. Many fans are now purchasing these to enjoy early flowers. They also do well as border plants in the South, being raised in the open fields of South Africa. This strain will possibly compete materially with the Dutch Strain in the future.

There are numerous firms in India that offer *Amaryllis* and other bulbs to the world trade. The quality of the *Amaryllis* offered varies greatly and one has no assurance of quality when ordering from this area. There is no such thing as a control or standarization of produce among the growers. What one firm provides as a Dutch Strain may be an inferior cross on the Dutch Strain, while other firms provide the true Dutch strain. It is understood that some firms go out and buy on the open market when you order from them. The quality will vary each time bulbs are purchased. It is understood that some firms in the area are trying to obtain controls on the quality of bulbs exported. It is hoped they will be successful for there are some excellent *Amaryllis* grown there which I would like to touch on.

Ludwig and Company have sold large quantities of seed to Indian firms and this strain is the main Dutch Strain grown in the area. Some

of the pinks, whites, and white lined pinks, however, are the Van Tubergen Strain. Many firms, to increase their stocks, have crossed the Dutch with the Indian and Australian strains and offered these as Dutch Strain. Some of these are excellent, but unless they are properly selected, will contain a number of inferior flowering sorts among them.

The Dutch strain from India is usually sold in mixture or in selected colors. If you are fortunate enough to obtain the true Dutch strain bulbs that have been properly selected, they are very worth while and can be purchased more reasonably priced than from Holland.

The Indian growers have also imported seed of the Australian Tunia strain. These amaryllis hybrids are sold by selected colors and in mixture. The true Tunia's from Australian are an excellent strain with very large flowers and a wide color range. They are mostly striped or bitones with stripes. There are some especially interesting colors in them such as yellow and red stripes and orange and brown tones. The better Australian Tunia hybrids are excellent and different. They should become more widely used as they are very vigorous.

There are many hybrids available in India of the Australian Tunia strain crossed with the Dutch strain. This is possibly the best strain for the border today of the large exhibition type. The color range is much extended over either the parent stock and some have mammoth flowers. There are many types and forms of flower and these are most interesting and worthy of trial. They are vigorous and make fine border plants.

Although a marked new interest in garden sorts is being shown, interest in the named clones continues. A large number of new clones are being offered each year. South African and Indian growers soon will be offering named clones. With the increase in number of clones each year it will become more important that these are properly tested before being offered and that only those of merit should be registered and offered to the public.

The *Amaryllis* fancier will have to become more discriminative. A collector should not grow inferior clones just for the sheer sake of collecting numbers. New clones should be worthy of introduction or eliminated.

New clones are always exciting to try, but one must never overlook the proven older ones that have performed well for many years. These must be mentioned. It is better to grow a number that do well for you than to experience disappointment and failure with new higher priced clones. There are many old ones that have proven noteworthy. Some do well in one part of the country while others may grow better for you under your particular culture, soil, and climate. If one would make a list of noteworthy older clones, the following would possibly be included in most lists:

'Apple Blossom', 'Bouquet', 'Ludwig's Dazzler', 'Ludwig's Scarlet', 'Maria Goretti', 'Leading Lady', 'Beacon', Red Master', Salmonette', 'Moreno', 'Daintiness', 'Alcyone', 'Queen Superiora', 'Doris Lilian', 'Cleopatra', 'Pinksterflower', 'White Giant', 'Tristan', 'Ameri-

can Express' [Fig. 20], 'Wyndham Hayward', and 'Delilah'. This list does not include all the worthy older clones for you possibly could list others that do particularly well in your area, but generally these can be expected to perform well in most areas.

Fig. 20. Hybrid *Amaryllis* clone 'American Express' (Ludwig), grown at Baton Rouge, Louisiana. Photo by Prof. Claude W. Davis.

Each year many new clones appear. It is impossible to properly evaluate these from one year's observation, but these observations will help in choosing those to try.

The whites are a strong class and many new ones are being introduced. Ludwig's 'White Favorite' appears to perform up to expectations. While it is still very scare, it will be a strong contender in this color. W. S. Warmenhoven's new white, "Snow Queen", was well received. It appears to be an improvement over his older clones; being larger and more vigorous. Since Ludwig has a clone of this name, Warmenhoven's "Snow Queen" will be renamed 'Oasis' when registered. 'White Crane' is a very strong growing new white. It makes large flat blossoms on a very tall scape and should make a fine show clone. 'Queen

of the White' should also be mentioned, while it is a very old variety, it is making a new comeback. Many fine reports were received on 'Queen of the Whites'. It should again make itself felt at the shows. 'White Christmas' and 'Christmas Gift' are becoming popular both being fine clones. 'Christmas Gift' is a very late flowering clone that is a very welcome addition for this reason.

The bicolors and striped clones are becoming more popular each year as better ones become available. 'Candy Cane', 'Apple Blossom', 'Beacon', 'Fantasy' and 'Love's Desire' continue to perform well. 'Zenith' appears to have the edge as a show flower in the red and white striped class. The clones sold under the name, "Picotee", still perform well, and with the reduction in price this coming season, will be more widely grown. Although these clones vary from near white with faint red picotee edge to nearly all red, they have an airy appearance about them that is refreshing and the color is generally very clean.

The new Warmenhoven clones, 'Floriade' and 'Golden Trumphator', are new departures in *Amaryllis* and point to new trends in this area that is a step away from the solid colors that have been in vogue. 'Floriade' is a most beautiful and striking clone. It has a crepy transparent appearance and is white flushed faintly pink with just a few fine pencil lines of pink in the lower three tepalsegs. It is a wonderful new pastel colored *Amaryllis* and a wonderful addition to any collection. 'Golden Trumphator' is a similar pastel in another color, being a light salmon with coppery orange overtone. These two will surely prove popular. Warmenhoven's "Rose Queen" (to be renamed before being registered) is an interesting orange pink with lighter heart that has a coppery cast. It is different and a fine addition. 'Little Diamond' like "Rose Queen", although not yet in general distribution channels and not registered, was purchased in Holland and distributed in limited quantities last season. 'Little Diamond' is the most beautiful pink you can picture. It is not a solid color but a very finely veined pink and white that appears pure pink. It has extra large flowers on a rather short spike. It is what many have been looking for in a pink, being round to a nicety and very flat. 'Pink Beauty', another Warmenhoven clone is somewhat similarly colored, being white finely striped rose. The rose striping is more pronounced, being a darker color. It, however, makes a huge flower on a very tall spike, and is a wonderful new clone. 'Maryland', a large white with pencil lines of clear red, is very striking. Like the other Warmenhoven varieties mentioned here, 'Maryland' has not been registered. It is understood that plans are being made to register these clones so they may be shown at official shows this coming season. Van Meeuwen's clone 'Verona' should also be mentioned. It is a beautiful salmon and white variety that has that clean refreshing look. 'Five Star General' is still popular though difficult to grow. It is a sparkling clean red and white.

The salmon and orange color class improves each year. 'Orange Wonder', a coppery orange, is popular even at a high price. Many say it is tops in the orange colored clones. 'Delilah', as grown in the South, is

a fine light orange or salmon orange, that has a clean color and should become popular. Many of the older salmons and orange reds are still good performers and very popular. 'Bouquet', 'Halley', 'Cleopatra', 'Anna Paulowna', 'Bordeaux', and 'Queen's Page' all perform well. There are some interesting new clones in this color. 'Rilona' is a soft buff that is a new color among Amaryllis. It is still unregistered although a small number of bulbs were distributed last season. It will not be generally available for several years. It did create much interest among those that saw it. 'Golden Trumphator' should again be mentioned, although more a two tone, for it is one not be overlooked in this color.

The rose pink and light rose colored *Amaryllis* are showing inprovement. 'Daintiness' is still among the better ones in this color, and one of the lighter colored clones. Van Meeuwen's 'Queen of the Pinks' and 'Queen of Sheba' are strong contenders as leaders in the medium rose pink color class. Van Meeuwen's "Pink Perfection" (unregistered and requiring renaming) is a strong growing medium rose pink with violet cast. Ludwig's 'La Forest Morton,' a medium light rose pink with lavender cast, is very beautiful and becoming very popular. The new 'Flora Queen' is one of the lighter colored rose pinks that has a wonderful clean color. It is a grand improvement in this color. In the light colored clones, 'Spring Dream', a salmon pink, is winning many admirers.

In the deep rose colored clones, 'Doris Lilian', 'Diamond', 'Moreno', and 'Violetta' remain popular. 'Bella Vista', Ludwig's new variety, has beautiful coloring and is a worthy addition to this group. Ludwig's 'Lucky Strike' is a good one. It is very hard to say just where Warmenhoven's new clone, 'Elvira Armayo' belongs. Some call it a wine red, others, a violet red. It is lighter than most other wine reds and possibly can be placed in the violet rose class. It is a new color and a worthy new one.

The light reds have never been a strong class and very few *Amaryllis* fall in this class as most light reds have a distinct orange cast. A few new clones are appearing in this color that are very nice. 'Mohawk', a new medium light red, has a beautiful self color and is large and very thrifty. It is a welcome addition which many will want to try this coming season. 'Red Emperor' is another new light red that is bearded and makes large flowers on a tall spike. These two new reds should prove to be popular.

There are a number of good orange reds,—'Haley', 'Cherokee', 'Friendship,' 'Prince of Orange' and 'Attraction' to name a few. This has not been a popular color but more are showing interest in the orange reds. Ludwig's 'Traffic Stop' is one of the newest introductions to this color. 'Don Camillo' is another fine orange red.

The medium reds include many good clones. Ludwig's 'Scarlet', one of the old standbys keeps performing even better each year. There are too many of these to mention. 'Blazing Star', one of the newer ones that is becoming very popular, grows large very easily. Ludwig's 'Goliath' is a huge variety that is extremely popular. There never is enough of this clone to go around and it will be a number of years be-

fore it is available to everyone. 'Giant Goliath' is also a very popular clone especially as a pot flower in the North.

There are a number of dark reds that are excellent. 'Queen Superiora' is possibly the grandfather of this color and can still compete with the best. Ludwig's 'Fire Dance' is a popular show clone. 'Alcyone' is outstanding that has a wonderful color. It is not a giant but what it lacks in size it makes up for in purity of color. Van Meeuwen's 'Hades,' and Warmenhoven's new 'Rotterdam,' are beautiful new dark reds that have a fiery light red sheen.

'Red Master' still is the leader of the dark wine red class but some strong contenders are appearing. 'Purple Queen' (W. Warmenhoven and Sons variety) is a large wine red with purple cast that is considered by many as the best in this color. Van Meeuwen's 'Charlemagne'' is a huge new wine red that has caused quite a lot of comment.

Interest is still being shown in the species but few are commercially available. Possibly the most noteworthy species reintroduced this past season was *Amaryllis belladonna* var. *belladonna* found growing in muddy clay soil near Iquitos, Peru. About 200 of these bulbs were distributed in the United States this past year. This appears to be a most robust form of *Amaryllis belladonna* yet found. Bulbs of this variety will grow to a diameter of 4″. It is hoped someone will propogate this variety and make it commercially available as it should prove to be an excellent pot plant. About 200 bulbs of a species from Matto Grosso, Brazil were also distributed this past season. This species is believed to be *Amaryllis striata* var. *crocata*. Mature bulbs of this species are only 1 to 1½″ in diameter. It grows easily in a pot if given a warm condition and plenty of moisture during the growing season. It makes numerous offsets and the flower is very large for the size of the bulb—about 5″ orange red and white. This species though not positively identified should prove most noteworthy as a pot flower and should prove helpful in developing a noteworthy small bulbed strain suitable for pot culture. A most needed type in my opinion that could be established in pots and make a most decorative plant in any home. It has very deep dark green foliage and reddish cast to back of leaves.

A very large bulbed and large flowered species or hybrid was found naturalized in Hawaii. This has been tentatively identified as *Amaryllis aulica* var. *platypetala*. It has a large red flower and is very strong growing. It apparently is a recurrent flowering species as the bulb tested flowered in the spring and again in August. This species has considerable vigor and is very noteworthy.

A few bulbs of an *Amaryllis* described by Dr. Cesar Vargas as species *Amaryllis intiflora* was tested. This species has a medium sized solid red flower a little larger than the gracilis amaryllis hybrids. It appears to be strong growing, making medium sized bulbs. It should prove worth while in breeding medium-sized amaryllis.

A shipment of 50 hybrid *Amaryllis* from Lima, Peru was imported this past season and a few of these flowered. They appear to be very vigorous of a medium size. The spikes have usually six flowers and are

of proper size not to appear crowded. Some of these had very clear colors. They are said to be the most noteworthy hybrids available in Lima.

Twenty different clones from a leading Brazilian hybridizer were imported this past season. A few of these flowered and were very good. It is however understood that these are sold in Europe and have been used extensively in recent years by Dutch Hybridizers. These should all flower this coming season.

Great progress is being made in show clones but hybridizers are neglecting to develop hardier and more vigorous stock for the garden and noteworthy easily flowered clones or strains for pot culture. It is hoped that greater interest will be shown in this area in the future for if the amaryllis is to become as popular as it should, more vigorous and easier flowering stock must be developed, or the interest in amaryllis will rise and fade as it has for the past two centuries. There is room in every home for an easily flowering potted amaryllis and room in every garden for a bed of amaryllis that will consistently flower each year.

BOTTOM HEAT FOR AMARYLLIS

Myles E. Hill, *Arizona*

I got the idea for supplying bottom heat to potted *Amaryllis*, using Christmas tree electric light bulbs, on a cord, during the holidays. I used the kind that will remain lighted even though one or more bulbs on the cord may burn out. The lights are set in one gallon cans so that each light bulb is at the bottom of a gallon can with a potted *Amaryllis* nested above it. The light current is then turned on. This operation is carried out in a cool dark room—I used an old photographic dark room. As controls similar potted *Amaryllis* were placed beside them but given no bottom heat. However, the conditions otherwise were not controlled as to temperature. Records are made of the number of weeks in darkness with and without bottom heat for Dutch hybrid *Amaryllis,* and also the number of weeks in a lighted room. At this writing no flowering results are available, but it was considered worth while to report the inexpensive method of applying bottom heat for forcing *Amaryllis* which others may wish to use. My results will be reported later.

TREATING AMARYLLIS BULBS AND SOILS

Mason M. Turner, *California*

One may treat his soil mixture in a sealed garbage can with chloropicrin at the rate of 5 milliliters per cubic foot of soil. Chloropicrin works best when the soil temperature is between 60° and 90° F. Most disease organisms are killed along with nematodes, soil insects, and weeds.

Chloropicrin is a heavy pale yellow liquid, which readily volatilizes into a pungent tear gas. Its chemical name is trichloronitromethane (CCl_3NO_2). The pure material is completely volatile and leaves no residue in the soil after aeration.

Chloropicrin can also be applied to field or bed soil directly with a hand applicator, but one may also use a pipette with a rubber bulb attached. It is important that the gas be confined by sprinkling the soil surfaces with water immediately after treatment or preferably by covering with a gas-proof cover which should be left on the soil for at least 24 hours.

Methyl bromide can also be used for the same purpose. It is more volatile and is released under a gas-proof cover (polyethylene sheet is excellent). One-pound cans with instructions for use are available at many nursery supply firms. After treatment, the soil must be well aerated so as to preclude any toxic effects on the plant.

The bulbs are treated prior to planting by completely dusting with a mixture* of insecticides and fungicide toxicants—Captan, Dieldrin, DDT, and Sulphur—formulated to give effective control of insects and diseases. Such a mixture may be obtained from your local garden supply dealer.

Prior to potting *Amaryllis* bulbs, I treat the soil mixture in a sealed garbage can with chloropicrin at the rate of 5 milliliters per cubic foot of soil for a period of 24 hours. After treatment, the soil is well aerated so as to preclude any toxic effects on the plant. Fumes should not be inhaled because they are toxic.

I have made comparative tests, using treated and un-treated soil, and have found that the plants grown in the treated soil are superior in growth and bloom. This stimulation is apparently due to the control of soil borne diseases and other pests. Before planting, the bulbs were completely dusted with a mixture of insecticides and fungicide toxicants—Captan, Dieldrin and D. D. T.—formulated to give effective control of insects and diseases. Such a mixture may be obtained from your garden supply dealer. Before treatment, the dead or damaged roots are removed.

The treated bulbs are potted in 8- or 10-inch plastic pots, taking care to work down into the soil and remaining roots. The potting mixture used consists of 1/3 garden loam; 1/3 coarse sand, and 1/3 granulated peat. When planted, 2/3 of the bulb is above the soil level. This mixture apparently provides good drainage and soil aeration which is so essential in keeping the bulbs healthy. After watering, the planted pots are placed on the greenhouse bench where a temperature of 60° F. is provided for several weeks.

CAUTION.—

Chloropicrin and methyl bromide are toxic to human beings and

* A commercial product known as Artho Soil and Bulb Dust. It is a combination of insecticide and fungicide formulated as follows:

Active Ingredients	By Wt.
Captan	5%
Dieldrin	5%
Dichloro Diphenyl Trichloroethane	10%
Sulphur	40%
Inert Ingredients	40%
	100%

precautionary measures as indicated on the original packages should be carefully observed.

EXPERIENCE WITH HYBRID AMARYLLIS

GLADYS L. WILLIAMS, *California*

It was noted that the little seedlings of Dutch hybrid Amaryllis growing in a seed bed outside lost their leaves during the cold frosty weather, but produced new ones and grew nicely as soon as the weather warmed up. This led me to experiment in growing hybrid Amaryllis.

Last year (1960), I made a number of crosses—some Dutch on Dutch hybrids, and some Dutch on selected Howard & Smith hybrid Amaryllis. The seeds were planted as soon as mature in May and June in pure compost in pots. The pots were soaked in water and placed in polyethylene bags stored in the shade. Germination was almost 100%. My garden space is limited, and I was fortunate in having a friend also interested in growing hybrid Amaryllis, who made a large part of her yard available for the experiments.

Her garden soil is a sandy loam. In a prepared bed, using composted manure, superphosphate and potash, 60 small 4 months old seedlings, ¼ inch diameter bulblets, were planted. At 8 months of age the bulblets were ¾ inch in diameter.

In another bed, I have set out 400 seedlings in the last two weeks of January (1960). The bulblets were ¾ to 1 inch in diameter at about 8 months of age.

Last year (1959) in April, I planted 300 seedlings of American hybrid Amaryllis, crossed with Dutch hybrids, one year or less in age. These are now 21 months old from seeds. They were mulched with old strawy manure to keep down the weeds. I dug down to measure the bulb size in early February and was happy to find that some were 2½ inches in diameter. I am hoping that some will bloom this spring.

NOTES ON AMARYLLID GROWING

IRENE STEWART, *Escondido, California*

When the writer moved from the Upper Rio Grande Valley in West Texas an arid country, in the autumn of 1949, and settled in Southern California, she thought her troubles in growing amaryllids were at an end. There was a rude awakening.

One is told to plant *Amaryllis* "in full sun". This was done, on a terraced slope, where the drainage should have been good. That winter there was not the zero weather experienced formerly, but lots of rain. The soil being heavy a considerable toll of the largest and best bulbs was taken by rotting and the foliage of the remaining lot was fairly cooked by the bright sun. The whole collection was again moved to a location only receiving the afternoon sun, no better success resulted. Seedlings were eaten by snails, which abounded. A third move was made, under the outer branches and to the East of a large Pepper tree, almost at once a change was noted. Better foliage and a greater number of blossoms, which appear intermittently, not just in the spring. Seeds

germinated and as there were no other plantings near, snails were less in evidence, so courage returned.

Many amaryllid species have been tried, only two will be specifically mentioned. Shortly after arrival a bulb of *Haemanthus katharinae* was planted in a bed on the South side of the house, it has multiplied to six stalks and this summer produced four flower scapes. In spite of poison and hand picking, snails disfigure the palm-like foliage. Personal opinion is that, although eye-catching the flowers are not nearly so beautiful as those of others in the family.

Vallota purpurea, Scarborough Lily, has been experimented with several times unsuccessfully until now. As formerly planted, the bulbs were covered with soil to the depth of one inch, as directed, only to have them rot. Two years ago, a bulb was purchased from a Coast Nurseryman—he cautioned—"Plant in open ground with half the bulb exposed". This was done but not where it received all-day sun. It has thrived, has three off-shoots and now has a very promising bud, well above the foliage. Which only goes to show that many methods advised do not always pan out and that it is only by "Trial and error" that one learns.

AMARYLLIS BLOOMS 22 MONTHS FROM SEEDS

Mrs. H. L. Harris, *Texas*

For years one of my fondest ambitions has been to bring *Amaryllis* into bloom from seed in less than three years; so in the Summer of 1959 I set out to see if I could make my dream come true. I began by preparing my growing medium, a mixture of sandy loam, garden compost and sharp sand in the ratio of 2-1-1, which gave me a good friable soil and one that drained well. I used seed from choice Leopoldii type Dutch hybrid crosses and planted them in redwood flats on June 3rd, 1959

I believe Mother Nature must have smiled on me, for in no time at all it seemed as though every one of the thin black wafers had sprouted into small green blades. These grew rapidly and with regular applications of fertilizer were soon large enough to be transplanted into larger flats. This I did on September 6th, 1959 and the seedling bulbs were then placed on a regular bi-weekly feeding schedule, consisting of alternate applications of Fish Emulsion and Ortho-Gro, both mixed according to direction for proper strength.

During the Winter of 1959 my husband built a small plastic greenhouse, this was placed over the flats to protect them from the cold north winds and rains that we have during the winter months. The feeding schedule was continued through the winter months and the plants responded by growing by leaps and bounds, and as soon as spring arrived the little greenhouse was removed so they could enjoy the warm sunshine.

The bulbs were transplanted to a well prepared garden bed on May 7th, 1960, bulb size at that time averaged about four inches in circumference and the regular feeding schedule was continued through the remainder of 1960.

Fig. 21. Hybrid Amaryllis—unnamed clone originated by Mrs. H. L. Harris, Corpus Christi, Texas. See text for description.

Much to my surprise and delight in early March of 1961 I discovered bloom scapes emerging from seven of the bulbs which then averaged eight inches in circumference. The scapes grew rapidly and the buds opened into lovely flowers in varying shades of orange-red and salmon, some of solid color and others with lighter striping and contrasting throat. The blossoms were Leopoldii, type D-5A, [Fig. 21] of heavy substance and measuring seven and one half inches across the face. I entered three of them in the Amaryllis Exhibit at our annual Lola Forrester Show, Corpus Christi, Texas, and was rewarded by receiving a blue ribbon on each.

The 1961 Season is just about over and the lovely blossoms and strong healthy bulbs and foliage spell a very happy end to "My Dreams Come True". I am anxiously awaiting next Spring as I am confident that in the Season of 1962, the rest of the bulbs will flower, and will be equally as rewarding as the ones that bloomed in just "Twenty-Two Months From Seed".

AMARYLLIS SPECIES NOTES

JOSEPH C. SMITH, *California*

The popularity of *Amaryllis* as a plant for specialization is indicated by the increasing quantity of these bulbs that are imported into this country each year from many parts of the world, and by the increasing interest and attendance at the various amaryllis shows. Along with the general enthusiasm for amaryllis hybrids there is an increasing number of amateurs who grow the species and even do hybridizing work with these original forms as they come from various parts of South America. Thus the demand for species is now sufficient to encourage nurserymen to import and offer them for sale. The various catalogs issued this season contain several listings not seen in previous seasons.

This mounting number of specialists in *Amaryllis* species is encouraging indeed to those who have worked in this field for a number of years. Experience has taught us that in one locality it is not usually possible to grow well all the more than fifty *Amaryllis* species now known to science. With sincerely interested specialists popping up in many parts of the country, including our newest state, Hawaii, we will soon find an area that suits the particular requirements of each individual species. With this accomplished, species bulbs should increase as rapidly as they do at home, and with the full cooperation of the growers in the various areas, there should be an abundance of material available with which to carry out the most interesting hobby of specializing in *Amaryllis* species.

In southern California the species that are winter growing and require a dry summer dormant period do very well. This includes *Amaryllis aulica, A. psittacina,* and *A. correiensis.* Also, the summer growing species that will tolerate a mild wet winter dormancy can be grown here with the aid of irrigation in our dry summer months. This group includes *Amaryllis immaculata,* the forms of A. *Elegans, A. striata, and A. vittata,* as well as *Amaryllis aglaiae* and *A. cybister*

among others. These two major growing conditions for this area can be further modified by moisture control, protected planting, and greenhouse culture, to allow many other species to be grown. The *Amaryllis belladonna* forms especially *Amaryllis belladonna major,* from the West Indies, are among the more difficult ones to grow here. A report from Hawaii indicates that *Amaryllis striata* naturalizes there. This area should hurry to stock all the forms of this beautiful species especially forma *crocata* which is the more tender form and not now generally available.

Since reporting in the last Amaryllis Year Book the author has again flowered *Amaryllis aulica* in the garden in November. In April *Amaryllis cybister* flowered beautifully for the first time in an out of doors planting. In July *Amaryllis correiensis* flowered again in a garden planting. A very nice form of *Amaryllis belladonna* received from the Organ Mountain region of Brazil has flowers similar to the miniature hybrid forms now available from India. Mature bulbs of *Amaryllis calyptrata* also received from the Organ Mountains of Brazil have not yet flowered. This season again *Amaryllis aglaiae* did not flower for the author. This was apparently due to moving the bulbs at the wrong season as these bulbs need to be established to bloom well. They tend to pull themselves down deep in the soil and become well anchored before blooming. *Amaryllis evansiae* is another species the author had had no success with. Bulbs tend to decline or rot outright here. Reports on the experience of other growers would be welcome in these pages on the cultural problems with *Amaryllis* species.

WEST COAST VALLOTA CULTURE

ROY HANSBERRY, *Modesto, California*

For at least thirty years, my mother of Puyallup, Washington, has grown a small-flowered red amaryllid which she prized for its free-flowering habit. When I visited her in the fall of 1958, I got a peanut-sized bulblet from the single large bulb she then had. This was rooted in sand and planted in the greenhouse in the usual potting mixture. After two years in the greenhouse, during which time it was not dried off, the pot was transferred to a lathhouse. The bulb bloomed in April and again in June, 1961. Both scapes bore seven florets. A color photo of the plant was identified by Dr. Traub as *Vallota purpurea,* a native of South Africa.

Detailed cultural instructions are given in the usual reference books, but in spite of the admonition not to disturb the roots nor dry up the plant, my mother handled the bulbs like *Amaryllis* that she grew. Each fall the plants were placed in the attic until the leaves dried up. The bulbs were brought back downstairs about January and watered. I expect the well-lighted but unheated attic and the wet western Washington winter climate helped to keep the bulbs in fairly good condition. The bulbs bloomed off and on all summer. The habit of blooming in full foliage adds to the beauty of this most attractive house plant.

NERINES IN THE SAN FRANCISCO BAY AREA

Grant V. Wallace, *Berkeley, California*

This account deals not only with hybrid *Nerines,* but with other members of that genus which the writer has grown in Berkeley.

In March, 1925, two dozen seeds of Barr hybrid nerines were received from the firm of Barr and Sons, Reading, England (as it was styled at that time). This genus belongs to the "green-seeded" group of amaryllids, in common with the closely related *Brunsvigia, Haemanthus Boophone, Cybistetes, Ammocharis, Clivia, Crinum,* and the like. For protection, the seeds were accordingly packed in a small, wide-mouthed bottle, surrounded with cotton.

I was unaware, at the time, that the hybrids' leaves are not winter-hardy like those of *Brunsvigia rosea.* As the season was well advanced, no frost occurred. The seeds were planted in pots of our native Berkeley soil—a clay loam—without being sprouted in peat moss.

Fig. 22. (left) *Nerine curvifolia* var. *fothergillii major;* and (right) Barr *Nerine* hybrids; as grown by Grant V. Wallace, Berkeley, Calif. Photos by Grant V. Wallace.

In six weeks, *every one* had germinated! My rabbit's foot must have been functioning 100 per cent, for such green seeds are usually more exacting in their requirements.

The seedlings were kept in pots (near the house) for the following four winters. In the summer of 1930, I somewhat rashly planted the now full-sized bulbs in an exposed area, far from the house. In October, several plants bloomed. However, as winter advanced, a series of light frosts nipped the leaves, but caused no damage to the bulb tissues. As subsequent experience indicated, frostbitten foliage results in meager flower production the following fall; a good leaf growth is essential to the setting of buds within the bulbs, just as it is with *Narcissus.*

Warned by this damage, I moved the collection to a frostless strip on the west side of the house, adjoining the driveway and beneath the overhang of the eaves. The fall of 1931 produced few blooms, owing to frostbite. Since that time—for twenty-nine years—the original colony has produced ever-increasing numbers of bulbs, with a full quota of flowers. Offsets are freely formed, forming sizable clumps.

Seeds are produced in quantity, often sprouting where they fall in the bed, which has been treated to about the composition of good potting soil.

The flower crop has been increasingly large and beautiful in each successive year [Figs. 22 & 23]. One may expect about 75 per cent bloom; some plants will rest for a season, but will proceed to set buds for the following year. This results in a sort of alternation, or rotation, which is of benefit to their vigor.

The colors range from pale blush pink through brilliant cerise, vermilion, dark red, salmon pink, and flaming scarlet. All have light-reflecting cells in the tepalsegs, giving the effect, under sunlight, of being sprinkled with diamond dust.

Some flowers have wavy segments; others have flat ones. Some have segments sharply recurved; in others, they are only slightly curved. One individual will be a definite "self," while its neighbor will show a median stripe of darker hue.

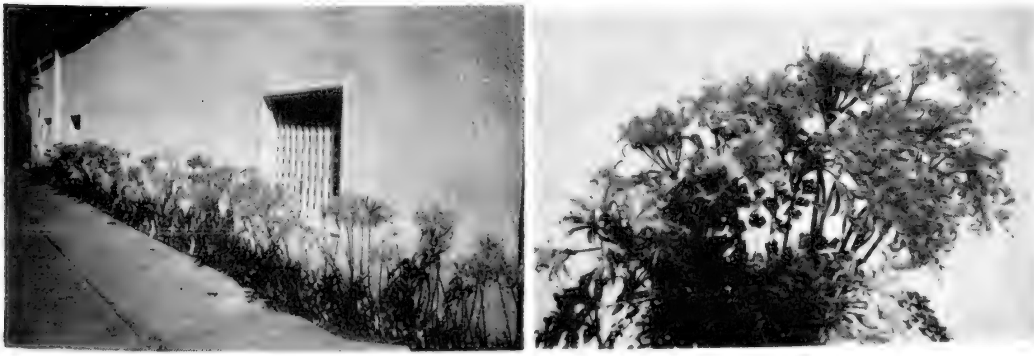

Fig. 23. Barr *Nerine* hybrids—(left) mixed seedlings; and (right) mixed seedlings in a vase. Photos by Grant V. Wallace.

In habit, they range from small, dainty forms, with scapes six or eight inches high, to tall, stout types with many-flowered umbels, usually salmon pink in color, but revealing the ancestry of the scarlet *Nerine curvifolia* var. *fothergillii major* [Fig. 22] better known as "*fothergillii*" in their size and vigor. The dominant ancestral form of the smaller types seems to be the Guernsey lily of the London flower marts (*N. sarniensis*), which has flaming scarlet flowers. Many hybrids are of this color, but there is a tendency for scarlet to be modified by the coloring of certain pink species, such as *N. bowdenii*. This results in a large percentage of individuals with brilliant cerise blooms—a color which many people do not favor, but which makes a lovely bouquet if unmixed with other shades. It should be noted here that nerines are ideal for cut flowers; they will keep in water for at least a week, and will proceed to set seed if left long enough in the vase. One strange hybrid form has deep-red flowers that fade to purple along the edges with age.

The leaves show two dominant ancestral trends in their coloring. Some are glaucous, reflecting *fothergillii* and *sarniensis* influence, while

some are dark green, which is usual with most other species. All are strap-shaped and scarcely channeled.

The growth cycle is very definite, and should be strictly adhered to by the gardener. About the first of May, the leaves die off naturally, and the bulbs become completely dormant. This state lasts until the middle of August, during which period the soil should be kept completely dry. Full sun is desirable; remember that these plants originated in South Africa, where it really gets hot. About August 15, water thoroughly. Growth of leaves and scapes will then start almost immediately. Don't let the plants become dry until the leaves start to brown off about the middle of April; this returns us to the beginning of the dormant period referred to above.

Following the initial August watering, the first flowers will appear late in September; the season lasts until late in November, with the peak in mid-October.

Pests and diseases are virtually nonexistent, to a degree that is comparable with the related *Brunsvigia rosea*. Snails, slugs, narcissus-bulb fly—all seem to shun nerines. Occasionally, a minor attack of the fungus known as "brown rot" may appear just beneath the bulb coating, but this seems not to thrive or to cause much damage.

To sum up: The *Nerine* hybrid strain is the "easiest" bulb that I have ever tried. Just remember to keep it away from frost when the leaves are growing; it asks nothing else.

When the bulbs are planted (or replanted, owing to increase), a layer of bonemeal applied well below their bases is beneficial. Unlike *Brunsvigia rosea*, moving the bulbs does not materially impede blooming.

An account of other *Nerine* types that the writer has tried in Berkeley may be of interest.

Nerine bowdenii, a true species, from the collection of Mrs. Anson S. Blake, of Kensington. Winter hardy; pink flowers in November, preceded by the leaves.

N. flexuosa, another true species from the same source. Of dwarf habit; flowers pink, with wavy tepalsegs; somewhat irregular, like *Sprekelia*. Inconspicuous; of botanical interest only. Winter hardy.

A type similar to *N. mansellii*, one bulb of which I picked up on the path of an old Berkeley home. Small and slender; flowers in the brick-red or vermilion color range; tepalsegs very wavy. Hardier than the Barr hybrid, but not completely so.

N. filifolia, a distinct species with rushlike leaves and small, pink flowers that resemble those of *N. flexuosa*. Evergreen and winter hardy; it has no dormant period in Berkeley.

N. curvifolia var. *fothergillii major* [Fig. 22]. A lovely species, with long scapes and large, brilliant scarlet flowers, which have sharply recurved tepalsegs and protruding stamens, reminiscent of a pincushion—a feature shared with the *sarniensis* type. While the hybrids have bulbs about an inch and a half in diameter, with short necks, this species has bulbs twice that size, with long necks. Strangely, it sets no seeds. Its blooming period is a month earlier than that of the hybrids—even those containing *fothergillii* blood nevertheless bloom later than the par-

ent species. The bulbs were presented to me by a good friend, dealer, and fellow collector, the late Gordon Ainsley, of Campbell, California. Following his death in 1942, I was privileged to assist Mrs. Ainsley in disposing of the amaryllids in the collection.

Mixed with a quantity of *Nerine sarniensis* bulbs (some of which I retained for trial) were a few that had very light-colored coatings. These turned out to be very large, tall-growing plants, apparently nerines, with pale-green, winter-hardy foliage and pink flowers that were suggestive of both *bowdenii* and *flexuosa.* The blooming period is in November and December. This *may* be the hybrid listed in the old Barr catalogue as 'Hera.' If such is not the case, its ancestry would be interesting to trace, because of its great size compared with that of the supposed parents. On the other hand, it may be a true species. Dr. Hamilton P. Traub will receive bulbs for determination, and it may be that he will have something significant to report in a subsequent issue.

REPORT ON THE MINIATURE AMARYLLIDS

LEN WOELFLE

I am pleased to note the current popularity of the miniature amaryllids as garden subjects here and abroad. Thanks to the collectors, for the many new species and varieties of *Zephyranthes, Habranthus, Rhodophiala, Sprekelia,* etc., a wealth of new material has recently been made available to us.

We can now look forward to the day when orangy hues, pinks and perhaps even white sprekelias may be selected from the hybrids being developed, or soon to come.

Beautiful new hybrids have already been developed in the *Zephyranthes,* and one of the most outstanding ones is 'Ruth Page' developed by Dr. T. M. Howard of San Antonio, Texas, from a cross between *Z. rosea* and *Z. citrina.*

During the past season I have been especially privileged to try a number of Dr. Howard's newer introductions, 'Alamo', 'Apricot Queen', 'Marcia', 'Maria Louisa', 'Peachy' and 'Prairie Sunset'. With no pampering and only a modicum of care they have all grown and bloomed beautifully, almost with neglect.

I particularly liked the larger flowered varieties like 'Marcia', 'Maria Louisa' and 'Prairie Sunset'. I liked the vigorous growth of the broad foliage and the strong scapes, the flaring trumpet shaped perianth tubes; but I suppose I liked most of all the ease with which they thrived in the poorest soil in my garden, giving a great measure of reward for so little attention.

The delicate blendings of pink, yellow and white in the clone 'Prairie Sunset' might have been plucked from the evening sky. 'Maria Louisa' was the most generous with bloom, but this may have been because the bulbs were larger. I look forward to another season when they will all have become a little more mature.

I understand that Dr. Howard will make some of these available to the amaryllid fans in 1962. I am pleased to recommend them to anyone

who is seeking something new in the miniatures. Each is different, all are excellent. For a new thrill in gardening try them.

My own efforts to hybridize the group have not been rewarding to date. Efforts to cross *Sprekelia* with the early blooming varieties of *Zephyranthes* so far have failed entirely. Last season I used pollen of the *Rhodophiala* on a number of late blooming *Zephyranthes* and obtained seed. There was little or no germination from the seed, and those seedlings which did develop were lost during the winter months, due no doubt to improper culture. I hope again to obtain seed from like efforts this season.

Rhodophiala species and hybrid should be hardy in many parts of the United States and crosses between these and the *Zephyranthes* would give multi-flowered miniatures in a variety of colors not now available. I would suggest that others try to experiment along these lines, if they have the materials at hand. Nothing could be lost, but much could be gained.

A PRACTICAL AND USEFUL DAYLILY DIGGER

W. Quinn Buck

Los Angeles State and County Arboretum, Arcadia, California

Some years ago, Tom Craig, the prominent daylily and iris breeder, told the writer about a specially made tool that he had found extremely useful in digging iris because it was possible to dig a single rhizome without disturbing the whole clump. This tool seemed to be something that would be equally good for digging daylilies.

A local welder made up several such tools, taking a curved piece of automobile spring twelve to thirteen inches long and welding it to the end of a six-inch piece of three-quarter-inch galvanized pipe for a handle. The digging end was then rounded off and given a reasonably sharp cutting edge.

These first models became indispensable tools, being especially useful for the difficult task of roguing daylily seedlings, but they did have faults. The cutting edge was not satisfactory, and the handles became quite uncomfortable in use. Dr. Hamilton P. Traub, who also had been using this first digger, suggested changing the cutting edge to make it an inverted "V", and he also suggested a bend in the spring steel to increase leverage.

A new welder had to be located, because the original one had become a specialist in making street sweeper brushes and he no longer could be bothered with such small jobs. The new welder made up several models incorporating these changes, and rubber motorcycle handlebar grips were put on the handles a bead being welded on the pipe to hold them.

The diggers having the right-angle bend proved less satisfactory than the original curved spring steel; so we have ended up by liking best a model having the V-notch cutting end on the curved steel. The handlebar grips make the tool far more comfortable to use. This digger

now seems good enough to recommend it to others who have the job of digging out many seedlings.

AMARYLLIS ARRANGEMENTS FOR THE HOME

Mrs. B. E. Seale, *Dallas, Texas*

Flowers add a distinctive note of beauty to the decoration of the home, not only for special festive occasions, but for every day living. Flower arranging is a self expressive, creative art and can become a fascinating hobby. Interest in correct Flower Arrangements for the home is very evident and it is increasing. A knowledge of Flower Arrangement has almost become a "must" with modern American women. Whether they live in a house of French Provincial, English, Colonial, Modern or Contemporary architecture and furnished to conform, there are designs that are suitable for each Period and for the Contemporary with the "New Look" in a Modern setting.

The pioneers in Flower Arrangement have established principles and a few rules; given instruction and inspiration that have developed a contemporary flower arranging art in this country. A knowledge of these principles will help those who feel that they can not arrange the flowers they have grown—because they do not have the "Knack". All can do it well enough to give pleasure and add beauty to the home if they will apply the important principles and standards of excellence.

Flower arrangement has gone far beyond placing beautiful flowers in a beautiful container; it is the "ART OF COMPOSITION". This is the result of putting together in a pleasing and orderly fashion different elements to make an arragement or composition that gives a sense of completeness and visual satisfaction. An arrangement has four definite considerations: the material (flowers and/or foliage), the container, the placement (with emphasis on background), and the occasion. Three elements have shape, size, color and texture.

There are some other qualities that apply to good arrangements. There must be Design, Proper Relation of Flowers and Container, Balance, Rhythm, Proportion, Unity, Harmony of Color Combinations, Suitability of Material, Distinction and Originality.

Design is the plan or pattern of the Arrangement or Composition. The Design may be inspired by the flowers and their fitness for the particular setting or placement. Good Design is seldom "Coldly Calculated", it is usually a result that evolves The inexperienced often feel uncertain because they can not visualize completely the finished arrangement when they start work. They must trust the unseen, the uncreated and work confidently that they shall make a worthy composition. The floral artist attempting to build a Design must recognize that line is the basic factor of the composition. There are several design forms to which flowers and or foliage are easily adapted, namely, the Triangle, the Rectangle (vertical or horizontal), the Circle and its variations (the Semi-circle, Hogarthian or "S" Curve), the Fan and the Zigzag.

Any flower arrangement is a Line Arrangement, a Mass Arrangement or a combination of both. A Line Arrangement is made with a

small amount of material, while a Mass Arrangement contains a large amount of material placed to give a full, yet not a crowded look to the finished composition. The Oriental influence in arranging has given the triangle form a tremendous popularity; it has been the Design form in the Orient for many centuries. The Design will be determined largely by the flowers and/or other material selected, the container and the placement in the room. Whether the flowers are chosen for the container or the container for the flowers, the two must belong together in order for the arrangement to be pleasing.

Fig. 24. Floral arrangements by Mrs. B. E. Seale—(left) crescent with three *Amaryllis* as the center of interest; (right) variously colored flowers with one large *Amaryllis* as the center of interest.

Balance is visual stability and it is achieved by the grouping of the individual forms around an invisible axis in such away as to create stability. Balance is a distribution of weight, achieved by size and/or color of the material. Symmetrical or Asymmetrical Balance may be obtained by placement.

Proportion is the graceful relationship of one part of an Arrangement or Composition to another part. It is closely allied to scale or size.

There should be Color Harmony and Textural Harmony for pleasing relationship. Color in Flower Arrangements can enhance the beauty of Design, but does not make Design. Good Design remains good with color absent. There are four general types of Color Harmony: Monochromatic or tints, shades and intensities of one color; Analogous or neighboring colors; Complementary colors (opposite each other on the

color wheel); and Triadic colors (three colors equally distant from each other on the color wheel). Flowers of one color or kind should be massed together; massed colors are better than spotty ones. Dark and heavy flowers are better at the base of an arrangement; place the lighter colored ones, small flowers and buds toward the top. If there are several shades, they should graduate from top to bottom with increasing intensity. The Center of Interest is often called the Focal Point or the Primary Accent. One large *Amaryllis* [Fig. 24] or three smaller *Amaryllis* blossoms may be used as the Center of Interest.

Rhythm is measured motion; the eye should follow thru the Arrangement with a feeling of motion. There should be an easy flowing of lines, forms and color.

Now this final quality of a good Arrangement. It should have "Distinction", which is another word for "Originality". All who arrange flowers should strive to make their arrangements and compositions different from those that other people make; strive to create something that will be out of the ordinary. Distinction and Originality are usually achieved after one becomes familiar with the mechanical details and from practice.

It is not necessary to be an artist or a genius to arrange flowers. All principles are based on reason and when one becomes familiar with their use by practice and experience, limitless is the pleasure, beauty and enjoyment you can create for your home and in the participation in local Flower Shows. We should not look at an Arrangement and say "What a beautiful Arrangement", but rather say "What beautiful flowers".

Let us not overlook the use of *Amaryllis* seed-pods in making Arrangements. We treasure them for propagating purposes, yet they have a very subtle charm used with *Amaryllis* blossons and other flowers. I use them in Line and Line-Mass Arrangements. Use them while the scape is stiff and green and the seed-pod is green.

Because of their size, form, coloring and dramatic appearance, a few *Amaryllis* in an Arrangement is more effective than many. However, an Arrangement, using *Amaryllis* entirely, with selected foliage, can be very exotic. Every flower, bud and leaf counts as a meaningful part of the Design. Place all *Amaryllis* blossoms in a simple plan that gives full value to their dramatic beauty. Avoid unnecessary bulk by thinning out some of the leaves on a branch of foliage to give pattern and design.

Foliage plays a dominant part in many Arrangements. The flowers appear more natural when the foliage has been placed at the base or back of the Arrangement. Lengths of Philodendron Vine, combined with Chinese Evergreen, make fine attributes for combining with *Amaryllis* blossoms. Fresh green, unopened canna leaves are effective with white, pink or red Amaryllis. Curled dark red and green canna leaves give height to an Arrangement; they are effectively used with red *Amaryllis.*

White caladium foliage, with its magnificent pattern of green veining, white stock or snap-dragon, and gypsophila, are beautiful with white *Amaryllis.* Mass the stock or snap-dragon and gypsophila into

definable areas, with seven to nine *Amaryllis* blossoms of various sizes to form the body of the Arrangement; place three white caladium leaves at the rim of the container—use as an Easter Arrangement.

For a Line Arrangement, use three *Amaryllis* buds and about eight small and medium size Amaryllis blossoms with self foliage and lengths of wisteria vine and place in a low container. For a Stylized Modern Line: make a pleasing pattern of foliage, using seven or nine *Amaryllis* or Peruvian Daffodil leaves, then place three *Amaryllis* of any chosen color, (three red, three pink or three white), in a vertical line. For a Modern Mass: arrange the background foliage; combine two shades of pink *Amaryllis* and dark red *Amaryllis* to give opportunity for color blending—for this, a vase or container of cranberry glass is pleasing. The red *Amaryllis* should be placed at the base, because dark colors are visually heavier than lighter ones and when we consider color as weight, brilliant color is the heaviest because it dominates attention.

Amaryllis and Azaleas combine well for a Crescent Arrangement. Fresh green rose leaves may be used as background and at the base, with three *Amaryllis* for the Center of Interest at the base of the Crescent [Fig. 24].

Flowers express many things: they are symbols of Love, Happiness, Beauty and Life. Growing flowers is a happy pastime and the arranging of plant material is an enchanting joy.

AMARYLLIS ROUND ROBIN NOTES, 1961

Mrs. Fred Flick, *Chairman*

Carthage, Indiana

[The following notes have been extracted from Round Robin letters by Mrs. Flick.]

Gladys Dusek, Texas,—"You are so right about feeding amaryllis. I don't believe that you can over feed them, and they certainly do repay you in bloom. Most of mine send up three scapes with from four to six blooms per scape. They get manure water about every ten days. I feed them bonemeal twice a year, and some balanced fertilizer in between. The hardy *A. johnsonii* and the *A. belladonna* thrive in the yard without much attention."

Marion Bush, N. J.—"I think that I have found the secret for those who live in the north. Mix plenty of peat moss and fertilizer with the soil. In the summer I take them all out of the pots, including the Dutch hybrids, and mix the peat moss and fertilizer into each spot where I set a bulb. When I pot them up in the fall I do the same thing. Ever since I have been doing this I have had more blooms and this year was the best of all."

Mrs. E. G. Frels, Texas,—Soil mix: pea gravel; burr compost (this is the burrs from the cotton); chicken manure; bone meal; vermiculite; and a little oyster shell. Mrs. Frels writes that a friend of hers at

[AMARYLLIS ROUND ROBIN NOTES, Mrs. Fred Flick, continued on page 26.]

PLANT LIFE

VOLUME 18

[Nos. 2-4, incl., Apr., Jul. & Oct.]

1962

General Edition

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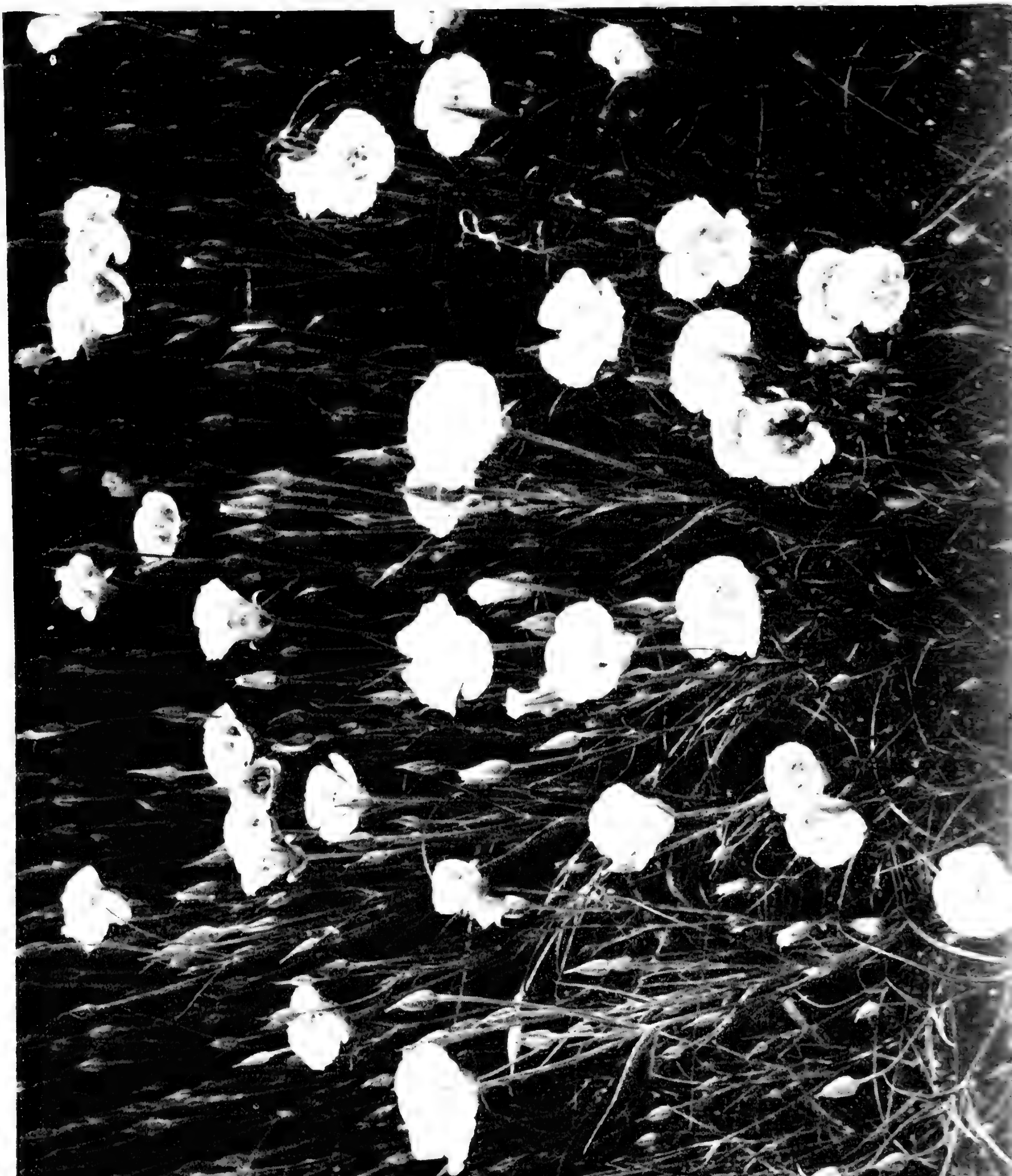

CALOCHORTUS

W. M. JAMES

The word 'calochortus' means "beautiful grass" and refers to the appearance of the foliage, both of the mature plants and the seedlings. The early Spanish Californians called it Mariposa, which is their word for butterfly The intricate and colorful markings on the petals reminded them of a butterfly wing. So both the scientific name and the common name in California indicate clearly the attractiveness of the plant and its flowers.

A brief review of the botanical history of *Calochortus* will provide a good background for examination of the genus. The name was first proposed in 1814 from plants collected by Lewis and Clark in what is now Idaho. Douglas in both trips to North America found and named several species. A number of new species were discovered during extensive botanical exploration in the West during 1880 to 1900. In 1901 Carl Pudy of Ukiah, California presented a revision of the genus. He probably knew more about many of the species than any previous or subsequent writer, both in the field and in his garden. Some of the species are so variable that there has been and still is some question about classification among the taxonomists. In 1930 Beal published a report on the cytology of the genus which proved to be an aid in determining the natural relationships among many of the species. In 1940 Ownby published a Monograph of the Genus *Calochortus* in which he includes a total of fifty seven species and thirteen varieties (and various subsections which we will not consider). Incidentally, some forty of these species are found in California.

Section I Eucalochortus
Section II Mariposa
Section III Cyclobothra

Calochortus is found only in Western North America. Its habitat extends from southern British Columbia to Guatemala and from the Pacific Ocean eastward to western Nebraska and the Dakotas. It belongs to the Lily Family and grows from a bulb. In Sections I and II the bulbs are membranous-coated and in Section III they are fibrous-reticulate coated. Most species set seed in abundance and it germinates readily. In some instances, offsets to the main bulb are formed and many species form stem bulblets in the axil of some of the lower leaves.

In general, culture is not too difficult if CERTAIN, DEFINITE requirements are provided. Protection from gophers is necessary. Good drainage is essential. Strangely enough, some species grow naturally in very heavy soils, but that is only where certain weather and moisture conditions prevail. Very few of them are found in damp soil. Most of

Fig. 25. (See opposite page)—*Calochortus luteus* Doug. ex Lindl., as grown in the garden of W. M. James, Saratoga, Calif. About half (0.53) natural size. Photo by W. M. James.

them prefer sandy or rocky soil on a slope and generally where grasses and other herbaceous plants are not too thick. They are found mostly on soils of low fertility, so should not be fertilized. Decomposed granite or light volcanic soil is excellent. Most kinds are better without leaf mold.

Many species are very subject to Mildew (Botrytis). This means that it is almost impossible to grow varieties from regions with a natural low humidity in a region with continual high humidity. I learned this the hard way. After starting with a good collection of bulbs and a quantity of seed of some kinds, it was disappointing to lose them all in about three years because of the mildew induced by coastal fogs which were frequent where I was living.

Chickering has written an excellent Monograph on growing *Calochortus*. Apparently he spent considerable time traveling, which enabled him to accumulate a good collection of species and varieties and a record of where various kinds grew in quantity. I cannot remember definitely when, but I probably first became acquainted with *Calochortus* about 1912. During the years since then I have found them only as somewhat isolated, widely scattered individuals except on two occasions which I will detail later on.

It should be mentioned that there seems to be very little data available on the life duration of an individual *Calochortus* bulb. So much depends on the soil and climate in the garden where the bulbs have been planted. Apparently these bulbs can grow year after year in their native habitat without blooming and then suddenly produce a mass of flowers.

This brief introduction brings us to the description of some of the calochortus individuals which I have observed growing naturally.

Section I. EUCALOCHORTUS are often called Globe Tulips. In some localities certain individuals are called Fairy Lanterns. The plants are medium high and generally grow on slopes where there is at least partial shade. The flowers are semi-pendulous and generally somewhat globular in shape. The white *C. albus* is widely distributed in Coastal areas and also in the Sierra Nevada regions. A Coastal form which is found sometimes in relatively damp areas is the one the children often call Fairy Lanterns. Back from the Coast in the warmer, drier regions two yellow ones—*C. pulchellus* and *C. amabilis*—and one pink—*C. amoenus*—are also found. These do fairly well under cultivation and increase readily from seed. They are not nearly as showy as those in the Mariposa Section, but are pretty and interesting and desirable in a collection.

Section II. MARIPOSA contains the largest, prettiest and most interesting individuals of the genus. The flowers are erect and bell-shaped (campanulate). Some species have only one flower on the stem (monochasial) while others are loosely branched (subumbellate) near the top of the stem and produce several flowers.

Calochortus venustus is probably as good as any to start with. A very lengthy article could be written on the varieties and strains of this

one. It is widely distributed in the Coastal ranges from San Francisco south to Los Angeles County and in the Sierra Nevadas from Shasta County south. It is probably the most variable in color and the most difficult to identify. Colors vary in different shades of red, yellow, lavender and white. Sometimes one color will predominate in a locality and represent a strain or variety. Sometimes several colors are found fairly close together.

A Forest Ranger stationed at Santa Barbara told me about the location of a large stand of *Calochortus* he had found in the Los Padres National Forest. It was in the higher foothills on the edge of Cuyama Valley, east of Santa Maria. For a few miles the dirt road followed a creek bed, climbing rather fast. After passing a couple of deserted homesteaders cabins, the dirt road disappeared completely and there were only occasional glimpses of the Ranger's car tracks in the grass as a guide. Then zig-zagging up several grassy slopes we emerged on a rolling meadow that was thickly covered with a few acres of *C. venustus* in a variety of colors.

About a month later I returned to this place expecting to get a big supply of seed. There was scarcely a single plant left! Grasshoppers had eaten everything and were still there looking for more. I took a few bulbs home, but these soon died from mildew. Strangely enough these plants were growing in a rather heavy adobe soil. The area had been opened for grazing when the ground was too wet and it had been severely compacted by the cattle. The bulbs I dug were very shallow—about one half inch deep.

Calochortus luteus is another one that is quite widely distributed in the Coast Ranges and in the interior. Certain forms seem to predominate in restricted areas. It is a bright yellow, but the different forms vary in color markings and because of this are sometimes difficult to identify. My experience with what I think is the type of *C. luteus* is worth repeating.

My daughter and her husband live at Novato in Marin County, a few miles north of San Francisco. For two seasons I saw only a few very widely scattered individuals of *C. luteus* in bloom on the hillside in back of their home. Then the third time that I saw them, early in June 1960, many of these plants were in bloom. They were in colonies scattered over quite an area. In a swale where there were many flowers a bulldozer had already started work on a housing project. So I dug a quantity of the bulbs. Later a large amount of seed was collected. These were planted in special soil in my garden near Saratoga. The bulbs bloomed prolifically in June 1961 and the seed came up like grass. [See Fig. 23]

In 1961 there was only about the same showing of blooming plants at Novata that I saw for two successive seasons prior to 1960. This is hard to account for. The rainfall for both 1960 and 1961 were both below normal. However, in 1960 there were no late spring rains. In 1961 there were several light rains during spring. The calochortus plants are difficult to find in the grass until after the flower bud has

started development. Because of this I made no effort to determine how many plants started growing. Possibly the late rains provided conditions favorable enough for the mildew to destroy many of the calochortus plants. Beal considers this plant a triploid, and yet it sets seed freely.

Chickering reports lack of blooming some years in occasional instances. Apparently the plant can start growing and later die back without completing a full cycle of growth. And do this repeatedly until conditions are favorable for flowering.

Calochortus clavatus is probably the largest plant and has the largest flower of the genus. I have seen it growing as scattered individuals in eastern Ventura County. Ownby reports its range in dry hills of the southern Sierra Nevada from El Dorado County to Mariposa County and in the south Coast Ranges from Stanislaus County to Los Angeles County. Chickering reports seeing it once in enough quantity on the old Ridge Route Road in Los Angeles County to make the slope where it was growing appear yellow. With the exception of *C. kennedyi,* I would prefer this species above all others which I have seen.

Calochortus kennedyi is a true desert species. Sometimes the flowers bloom almost on the ground. Plants growing under a low bush will have a flower stalk a foot or more high. I have found it in the Mojave Desert a few miles south of the City of Mojave and near the entrance to Frazier Mountain Park. In the southern part of its range the flowers are vermilion, sometimes orange. Eastward a yellow form is found. In Arizona the yellow form is more frequent. Although this is the most brilliantly colored of the genus, it is also the most difficult to grow under ordinary garden conditions.

Calochortus catalinae grows in a rather restricted range in Southern California. In some parts of its range it is plentiful enough to be called the "Common Mariposa". It is found from Santa Barbara County in the north southward through Orange County. It is white and not too difficult in the garden.

Chickering reports seeing the brush burned one fall on a mountain side in Ventura County. The following spring the burned over area was a mass of *C. catalinae* flowers. The next season, after the brush, dodder etc., had started to grow again, there were very few Mariposa flowers. This is another example showing that this bulbous plant is able to produce only vegetative growth for some time until conditions are favorable for reproductive growth.

The seeds of many California plants can remain dormant for several years until growth conditions are favorable. I have seen *Pinus muricata* seed come up like grass after a fire. Otherwise the seeds remain in the cones in a viable condition on the trees for years. *Dendromecon rigidum* has an explosive pod which will throw the seed ten feet. After a fire a heavy germination often occurs. Ordinarily this seed is very difficult to germinate. Thirty days stratification at forty degrees Fahrenheit gives satisfactory results, but the easiet way is to plant the seed in a flat, water it thoroughly, then pile about six inches of dry

straw over the flat, set it on fire and let it burn off. And the Bakersfield area is famous for the annual wild flowers which bloom only every seven or eight years when there is a season wet enough.

So much for the Mariposa Section. There are many more I would like to become acquainted with, but they are becoming more and more difficult to find as "Civilization" spreads and the population increases.

Section III. CYCLOBOTHRA are sometimes called Star Tulips. The flowers are usually smaller and the petals generally narrower and more pointed than in those of the other Sections. On some kinds the flowers with their "hairyness" and coloring are as intriguing as the ffowers of some of the species orchids.

Calochortus obispoensis is especially interesting, even though the flower is comparatively small. It grows in a rather limited area in San Luis Obispo County. Strangely enough, the over-all color is slightly greenish in appearance. I have seen it growing on a rocky hillside where the rocks have a greenish-waxy color.

I have very little acquaintance with the members of this Section. They are found more extensively in the northern, southern, and eastern limits of the *Calochortus* range. Chickering says that many of them "domesticate" easily.

Calochortus certainly are worth the effort it takes to grow them in the garden. The necessity for well-drained sandy soil cannot be emphasized too strongly. In fact, many of the species of the genus would be classified ecologically as xerophitic. Not many of them will grow in a region where the relative humidity is very high. Unfortunately I know of no commercial source of these bulbs at the present time. Probably the best way to start a collection is to gather seeds. People who really appreciate the plant rarely dig any wild bulbs, and then only in small quantities. The beauty of the flowers more than repays the special effort it takes to grow them.

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Abrams Illustrated Flora of the Pacific States.

Jepson's Manual of the Flowering Plants of California.

Munz's Manual of Southern California Botany.

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PLANT LIFE LIBRARY

CELL HEREDITY by Ruth Sager and Francis J. Ryan, John Wiley & Sons, Inc., New York, N. Y. 1961. pp. 411. $7.50. Ryan and Sager present an excellent treatment of the tremendous advances made in the field of molecular genetics over the past 20 years and its impact upon other biological disciplines. The authors have aimed their message at, "the curious-minded of all ages from college students to mature scholars in disciplines other than genetics." In the opinion of the reviewer this goal has been attained, although considerable background in biology, with some knowledge of elementary biochemistry will be needed to read the book with maximum profit. The faint-hearted will most likely be deterred by the page-long dia-

grams of structural formulae of the nucleatides of DNA and RNA, the Delta-helix configuration of a protein, and others. But an understanding of the hereditary determinants, their chemistry, replication, mutation, transmission and above all the system or systems by which they exert control over cellular processes is not calculated to make light reading even for the most avid scholar.

There is an urgent need for a text that brings together in a meaningful synthesis the rapid advances in our knowledge of the genetics of microorganisms with other facets of cell biology. Moreover, a skillful integration of this material should demonstrate centers of weakness in present information, thus suggesting new concepts for testing, and providing for continued progress. The authors have recognized this need, and their informative, clean-cut, well-written book deserves high priority on the reading list of all biologists.

The book is tightly organized into 12 chapters of approximately equal length (about 32 pages), followed by a short terminal chapter of 10 pages. It commences with a chapter on "The chemical basis of heredity," followed by others with such headings as: "The mutable unit of heredity," "Recombination in sexual organisms," "Cytogenetic correlations and crossing over," and "Recombination in viruses and bacteria." Next comes a chapter with the challenging title, "What is a gene," followed in sequence by those on "Chromosome duplication and genetic recombination," "Mutation as a chemical process" and "Nonchromosomal genes." The final three chapters are concerned with, "Mechanisms of gene action," "Genetic control of cell integration" and "Heredity in somatic cells." The last chapter ("The summing up") is a succinct statement of present knowledge with respect to the nature of the hereditary materials, transmission mechanisms, and gene action. In the final section the authors examine and evaluate the few facts and numerous theories about, "Replication and the origin of life."

Among the many fine components of the book are the well-executed figures, tables and graphs. There are also 14 plates, faultlessly reproduced, but it is not clear how they are related to specific material in the text. Most of the plates are electron micrographs of various animal and plant tissues, including a sectioned cell of *Escherichia coli*. There are also several of Rhodes' beautiful photomicrographs of maize chromosomes at meiosis, and one of the salivary gland chromosomes of *Drosophilia*. The bibliographic citations though not numerous are probably adequate for the purposes of the book. They are conveniently assembled at the end of each chapter. There are good indexes, both author and subject, each, unusually accurate. The authors and publishers are to be congratulated upon the pleasing format of the book and the absence of annoying typographical errors. A glossary of technical terms might have added to the value of the book, but this would probably have increased the price ($7.50) which is surprisingly reasonable by present standards.—*Thomes W. Whitaker.*

INTRODUCTION TO SOIL MICROBIOLOGY, by Martin Alexander. John Wiley & Sons, 440 Park Ave., So., New York 16, N. Y. 1961. pp. 472. Illus. This outstanding expository text on soil microbiology was written to satisfy the practical interests of the agronomists and also the theoretical concerns of the microbiologist. The author considers the biological processes that take place in the soil, the nature of the soil microflora, and the biochemical aspects of the field of soil microbiology. After considering the biological habitat, and ecology of the soil microorganisms, the author discusses the carbon, nitrogen and mineral transformations that take place in the soil. This is followed by the consideration of the interrelationships that occur between microorganisms and the plant. This excellent, well-written text is indispensable to the student, teacher, and research worker in soil science, bacteriology, mycology, plant pathology and agronomy. Highly recommended.

[PLANT LIFE LIBRARY, continued on page 4]

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For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

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This is required reading for every amaryllid enthusiast.

2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $2.50 postpaid.

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THE PHYLA OF ORGANISMS

By

Hamilton P. Traub

1962

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

DEDICATED TO

MICHEL ADANSON (1728–1806), FOUNDER OF

THEORETICAL SYSTEMATICS

Published as a supplement to PLANT LIFE, Vol. 18. 1962.

THE PHYLA OF ORGANISMS

HAMILTON P. TRAUB

1. INTRODUCTION

The classification of organisms presented here is a general summary, down to the phylal level, with some groups carried down to still lower levels, and is published at the request of members of the Society for a comprehensive general grouping for guidance in further study on the basis of a selected bibliography. This will serve until the complete version down to the familial level will be published a little later. This interest by students is an outgrowth of the general reawakening of interest in the sciences in the atomic age. A few have asked for information on the background training needed for a career in biology, including specialization in biosystematics. This is a borderline subject and little success can be expected above the routine level unless a background training of the widest possible extent is obtained. This should include a solid grounding in mathematics, physics, chemistry, geology and biology, not to mention the work in the other sciences and the humanities which are sometimes indirectly concerned, and which are required in all university training. The time has long been passed when biosystematics can be equated with nomenclature, a necessary tool only, and a smattering of only a part of the basic sciences.

The present classification grew out of the writer's insatiable curiosity about all biological matters. In his undergraduate years at the University of Minnesota in the 1910's, the writer was initiated into the fascinating subject of phylogeny of organisms in connection with biology courses, particularly under the guidance of the late F. E. Clements. Although Dr. Clements soon joined the staff of the Carnegie Foundation, his influence has been lasting for the writer had started to make a comprehensive classification of organisms *for his own use* and enjoyment under the inspiration received. The classification was revised periodically during the years—in the 1930's, the 1940's, the 1950's and again recently.

The writer wishes to express his gratitude to the authorities listed in the selected bibliography. It has been a pleasure and an inspiration to study their data and conclusions which have in many cases been deliberately drawn on as indicated by the citations, or may have influenced the presentation indirectly.

2. HYPOTHESES ON THE ORIGIN OF LIFE

The suggested age of the earth is 4.5 billions of years, and life has apparently existed on it for nearly half of this time (see H. N. Andrews, 1961). Life on earth is based on amino acids linked with protein molecules, and it requires a watery environment, and a narrow temperature range. It is not known how life originated. Hypotheses have been proposed to fill this knowledge gap. Contemporary scientists believe that life originated from the inorganic state of matter by natural, material processes. In this connection, Rensch (1960) states that various known levels of organization—(1) macromolecular viruses, (2) organized viruses, and bacteriophages consisting of various chemical compounds; (3) rickettsia, anaplasmids, cysticetes; and (4) bacteria—provide a possible clue to an understanding of the origin of life as a series of successive steps, the first and most important of which was the formation of nucleoproteins capable of reproduction. Rensch (1960), of course, does not claim that this progression can be equated with the actual phylogeny of life, but only that it could be looked on as a model to assist in a discussion of such a possible origin. It should be added that we are a very long way from being able to identify such a model with what really happened.

The 'primary heterotroph' hypothesis is among those proposed (Oparin, 1923, 1938, 1953; Simpson et al, 1957; and others) to account for the origin of life. According to this view, in the absence of scavenging organisms, organic materials were accumulated under the conditions that existed in the early history of the earth. Experiments, such as those of Miller (1953) and others, are cited in possible

corroboration. In this organic substrate, life is supposed to have originated as 'primary heterotrophic' (saprophytic) organisms, but before the store of primary organic materials was used up, photoautotrophic' organisms evolved by mutation from the primary dependent feeding organisms ('primary heterotrophs'). Through natural selection, the more efficient photoautotrophs could have displaced the 'primary heterotrophs' and have given rise to 'secondary heterotrophs' (parasites and saprophytes), such as those we know today. This bare outline does not do justice to this hypothesis and the reader should consult the references cited for a more detailed exposition.

Needham (1959) has recently subjected the 'primary heterotroph' hypothesis, which he characterizes as an 'ametabolic' view, to criticism. He proceeds on the assumption that the origination of life was "a spontaneous, natural sequence of 'most probable' events. Survival by natural selection is a particular example of a most probable event, and therefore operated at all stages of the origination. True evolutionary novelties have been most probable responses to new environmental conditions, and may have become rarer as the rate of change of the causal conditions decreased." He explains that "it is more probable that all significant materials and reactions were acquired early, panglobally and in quantity, and that subsequent evolution was restricted (a) to most probable innovations . . . and (b) to less fundamental changes, depending in part on changes in the biological environment itself. In general there has been biological simplification during evolution, rather than the converse." According to Needham (1959), an 'ametabolic' view such as that proposed by Oparin (1923, 1938, 1953) and others "leads to the questionable conclusions that there were originally no autotrophs, no photoactivated endergonic syntheses, no need for solar energy, and no decay, that the initial heterotrophs could feed indefinitely on a limited store of pristine compounds, and that generally reducing conditions prevailed on the early earth. This view fails to recognize that the general level of oxidation is less important than the maintenance of a potential difference in free energy between organism and environment. It also tends to overlook the relative rapidity of the circulation of organic materials through living systems, and the evolutionary implications of this."

Chemoautotrophs.—In the previous discussion, nothing has been said about the origin of the chemoautotrophs. According to one hypothesis, these could have arisen independently of the photoautotrophs in the early history of the earth when conditions were radically different from what they now are. According to Woodruff & Baitsell (1951, p. 50), the chemoautotrophic "process possibly represents the most primitive method of nutrition and the one from which all others have been derived during the evolution of life." In discussing the hydrogen bacteria, Thomas (1956) states that "It is to be noted that free gaseous hydrogen is not present in any environment where existing organisms (hydrogen bacteria) grow. The power to oxidize hydrogen may be a purely accidental biological attribute without any historical significance. But inasmuch as in those primeval epochs when things able to grow and multiply first came into existence, free molecular hydrogen may possibly have been present in the atmosphere, there is scope for speculative argument that the power to consume hydrogen may have had functional significance in some primitive ancestors of the existing hydrogen bacteria."

According to a second hypothesis, the chemoautotrophs originated from the photoautotrophs.

This is not the place to pursue this subject further. Whether primary dependent feeders evolved into independent feeders, which then gave rise to secondary dependent feeders; or whether independent feeders came first and then gave rise to dependent feeders together with chemoautotrophs, really should not delay us in classifying organisms because the hypothetical questions may not be answered in our time. Organisms have to be classified today.

3. THE STATUS OF THE VIRUSES

With the epoch-making discovery by Avery, McLeod & McCarty (1944) in connection with data concerning microorganisms that nucleic acids may possess biological activity, the stage was set for the break-down of the formal lines between cytology, genetics, immunology and virology. As pointed out by Horsfall (1961),

with the discovery that a nucleic acid molecule can reproduce itself in a biological environment, that it is "the chemical basis for heredity and that the biological phenomenon, identified as the gene, is in fact attributable to a specific polynucleotide sequence, molecular biology became a reality, and the long-hoped-for marriage between the biological and the physical sciences commenced." Progress in this field has been fairly rapid so that (Rich, 1961) could write that "It is clear that desoxyribose nucleic acid (DNA) acts as the major carrier of genetic information."

Commenting on this break-through in a recent book, Asimov (1960) took a rather extreme view as shown by such statements as "Modern science has all but wiped out the border-line between life and non-life". Commoner (1961) took him to task and pleaded for a true alliance between biology, on the one hand, and physics and chemistry, on the other. These discussions were later followed by rebuttals. Asimov (1961), for the affirmative, again insisted that "All of the substances of living matter enzymes and all the others, whose production is catylized by enzymes—depend in the last analysis on DNA." Najarian and Commoner (1961) replied for the negative. The student should read these discussions in full so as to sharpen his ideas about the transformation that biology is undergoing today.

In the light of these events, the debate, first set in motion by the crystallation of viruses by Stanley (1935), as to whether or not viruses are living organisms is apparently meaningless as pointed out by Pirie (1937), Luria (1953) and Zinder (1960). It is clear that viruses cannot be referred to as 'living' in the usual sense of a complete organism, but Rensch (1959) has pointed out that it should not be forgotten that they "display four essential characters which are typical of living beings: (1) their chemical structure, with prevailing protein and nucleoacid; (2) their faculty of identical reproduction (though possibly not always direct), permitting a type of constancy through long chains of 'generations'; (3) their individual cycle . . . and (4) their mutability." He explains that one vital character is still lacking—'energy metabolism'.

Luria (1953), an outstanding authority on the subject, defines viruses as "submicroscopic entities, capable of being introduced into specific living cells and of reproducing inside such cells only." He considers viruses as "truly the stuff of which all life is made", but concludes that "A virus is nothing but part of the cell. We observe and recognize as viruses those parts independent enough to pass from cell to cell, and we compare them with other parts that are more tightly tied up with the whole system."

In the present paper, the viruses which can reproduce only inside the cell of the organism, and thus have to make use of the machinery of the cell for achieving growth and reproduction, are considered as parts of the cell, and not on the same level with cellular organisms. Thus they are outside the scope of the present article.

4. THE HIGHER CATEGORIES

The basic category in biology is the species. From the evolutionary viewpoint as indicated by Meglitsch (1954) and Simpson (1961), the species "is a lineage (an ancestral-descendant sequence of populations) evolving separately from others and with its own unitary evolutionary role and tendencies." This definition is applicable to uniparental (asexually reproducing) as well as biparental (sexually reproducing) lineages. The species itself may be composed of individuals, or, of two or more subgroups, each of which is composed of individuals. Thus the individual has no standing except as a member of a species, or of a species subgroup. Genetics deals with the origin of the individual; systematics deals with the origin and fate of populations. For convenience in discussion, the remarks will be confined to sexually reproducing species.

Except between species within some genera, and rarely between some species of different but closely related genera as now drawn, within the same family, there is no gene exchange. This is so because evolution is an irreversible process. For instance, once the species of the genera *Lilium* and *Gloriosa*, which are properly drawn and both belong to the family *Liliaceae*, have evolved to their present status, those of the first, as can be shown experimentally, are forever separated from the second as far as gene exchange is concerned. From the standpoint of morphology and functioning, species of these two genera cannot return to the status of the

ancestral lineages from which they evolved. Each one is conditioned by the residues from past evolution; each may resemble other lineages in some particulars. but as lineages each will remain distinct. As pointed out by Rensch (1959) and others, the mechanism causing diversity, on which the higher categories (that is above the species level—genus and higher) are based, is the identical mechanism involved in the evolution of the species. As the diversity among species increases with the lapse of time, and large sections of species die out in the course of natural selection, great valleys are left between the mountain peaks of surviving species which are 'united' below by the bond of phylogeny or descent. One or more of such distantly related 'peaks' of surviving species represent the basis of the higher categories.

Number of higher categories.—In systematic practice, one or more presumably related species are grouped together to form a more or less objective group called a genus. These species are presumed to have arisen from a common ancestral stock. One or more of such genera are grouped under a family, and so on, in an ever rising presumably phylogenetic hierarchy as shown in Table 1.

Table 1. The hierarchy of categories in biology.

Kingdom (one or more phyla)
Phylum (one or more classes)
Class (one or more orders)
Order (one or more families)
Family (one or more genera)
Genus (one or more species)
Species (composed of one group of individuals, or two or more of such subspecific groups)

The higher categories listed in Table I represent a bare minimum. In actual practice other categories usually have to be interpolated between those shown. There are those who believe that only a small number are needed by the systematist, but they fail to realize that under such a handicap, the inter-relationships can hardly be adequately indicated, and the so-called classification remains a vaguely delineated system. Others prefer to amplify the number of higher categories so as to indicate with greater exactness the ideas that underlie a proposed system. Unfortunately, the biological societies have not provided a comprehensive uniform series of higher categories, and thus the individual worker has to add those needed to express his ideas about the presumably phylogenetic relationships within the classification. The writer has compiled a comprehensive list (including 32 levels) entirely for his own use (see Table 2), which he has found useful in writing down his comprehensive composite classification of the phyla of organisms summarized in Table 21.

According to the Botanical Code (Lanjouw, et al, 1956), the principles of priority do not apply to category names above the rank of order, but it has been said elsewhere that this is really confined to the rank of family. In practice, names of categories above the rank of order are taken from characters indicating the nature of the organisms included, with appropriate endings. Category names above the rank of genus—up to and including the rank of order—are taken from the nomenifer (type) group in each case, with appropriate uniform endings. The Zoological Code (See Schenk & Masters, 1956) does not include provisions as extensive as this.

The status of the viruses is still unsettled in the minds of some, but from our standpoint they belong with organelles—parts of cells, and thus are in the field of the anatomists and physiologists. The nomenclature of the viruses is necessarily tentative until it is possible to adequately categorize them. As has been pointed out in detail above, the subject is extremely technical since it deals with mono- and polymolecular organism-like groups. Accordingly, the nomenclature of the viruses can only be adequately handled by the virologists themselves. Recently, C. H. Andrews, et al (1961) have published a *tentative* classification of the viruses infecting vertebrates based on seven characters—nucleic acid, size (mμ), number of capsomeres, membrane outside the capsid, multiplication, maturation at the cell

surface, and ether sensitivity. This will undoubtedly be extended to include the other viruses as more information about these organelles accumulates.

Table 2. List of higher categories, with uniform endings. Categories and endings in **bold face** are authorized in the Botanical and, or Zoological Codes. All others have been supplied by the writer.

Category designations	Category endings: Plantae	Heterplantae *	Animalia
Superkingdom	-ae	-ae	-ia
KINGDOM	-ae	-ae	-ia
Subkingdom	-ae	-ae	-ia
Infrakingdom	-ae	-ae	-ia
Superprovince	-iae	-iae	-iae
PROVINCE	-iae	-iae	-iae
Subprovince	-iae	-iae	-iae
Infraprovince	-iae	-iae	-iae
Superphylum	-phytae	-mycotae	-a
PHYLUM	**-phyta**	**-mycota**	-a
Subphylum	**-phytina**	**-mycotina**	-a
Infraphylum	-phytinae	-mycotinae	-a
Superclass	-opsidae	-mycetiae	?
CLASS	**-opsida**	**-mycetes**	?
Subclass	**-idae** **	**-mycetidae**	?
Infraclass	-idinae	-mycetinae	?
Supercohort	-corae	-corae	-corae
COHORT	-coae	-coae	-coae
Subcohort	-cosae	-cosae	-cosae
Infracohort	-conae	-conae	-conae
Superorder	-iales	-iales	?
ORDER	**-ales**	**-ales**	?
Suborder	**-ineae**	**-ineae**	?
Infraorder	-inreae	-inreae	?
Superfamily	-aciae	-aciae	?
FAMILY	**-aceae**	**-aceae**	-idae **
Subfamily	**-oideae**	**-oideae**	-inae ***
Infrafamily	-oidinae	-oidinae	?
Supertribe	-ieae	-ieae	?
TRIBE	**-eae**	**-eae**	?
Subtribe	**-inae** ***	**-inae** ***	?
Infratribe	-inrae	-inrae	?

* See Figs. 1 and 2; and Table 21.
** This ending appears under both **Plantae** and **Animalia**, but in different ranks.
*** This ending appears under **Plantae** and **Heteroplantae** in the same rank, but in a different rank under **Animalia**.

Uniform category endings.—An inspection of Table 2 shows that the higher category endings, which have been taken in part from the biological codes with additions by the writer to fill in some of the gaps, represents a patchwork. Such category endings as have been adopted by the societies from time to time were put forth without any unifying principles for biology as whole. In some cases the same endings appear for different categories under plants and animals. Surely in this atomic age communication between the branches of biology should be such that agreement could be reached to erase these inequalities. Although the category ending represents but a detail in nomenclature, it should receive proper attention. It is helpful to the worker if he *is relieved of the detail* of coining such endings, and is thus able to *devote his entire time* to research.

Simpson (1952) considered the subject of uniform category endings and came out against them, contending that the more or less non-uniform endings used in zoology have been long in use and that it is now too late to make any changes. However, Stenzel (1950) had earlier pointed out that if the same uniform endings were used above the rank of genus, then the reader could recognize at a glance the category itself as well as the degree. With different endings, only the specialist could recognize them. It would be all to the good if a joint committee from the botanical and zoological societies could work toward the end that agreement could be reached on fundamental principles for category endings. Such a committee could also make recommendations for cases where the same endings appear in different categories.

Table 3. Analysis of some uniform category endings from the viewpoint of the criteria discussed in the text

Kingdom	category rank series	category rank series indicator	category degree indicator suffixes: super	basic	sub	infra	Examples
Plantae	Superphylum	**-phyt-**	**-ae**				Autonitrophytae**
"	Phylum	"		**-a**			Autonitrophyta
"	Subphulym	"			**ina**		Autonitrophytina**
"	Infraphylum	"				**-inae**	Autonitrophytinae**
Heteroplantae*	Superphylum	**-mycot-**	**-ae**				Schizomycotae**
"	Phylum	"		**-a**			Schizomycota
"	Subphylum	"			**-ina**		Schizomycotina**
"	Infraphylum	"				**-inae**	Schizomycotinae**
Plantae	Supercohort	**-co-**	**-rae**				Lilicorae**
"	Cohort	"		**-ae**			Lilicoae**
"	Subcohort	"			**-sae**		Lilicosae**
"	Infracohort	"				**-nae**	Liliconae**
Animalia	Superfamily	**?**	**?**				?
"	Family	**-id-**		**-ae**			Hominidae
"	Subfamily	**-in-**			**-ae**		Homininae
"	Infrafamily	**?**				**?**	?

* See Table 21. ** Not actual taxa recognized by the writer; used only as examples.

As to the endings themselves, those above the phylal level could be very simple and need not show degree, as shown in Table 2. But even here it would be desirable to have distinctive endings if possible.

At the 'phylal' level, or below, the ideal category endings should comply with the following criteria: (1) begin with a consonant; (2) have a first part that serves as a category rank series indicator; (3) possess a final part that serves as a category degree suffix; and (4) be short. A few examples have been analyzed in Table 3.

The examples of the endings at the 'phylal' rank series level, in Table 3, show that the endings, *-phyta* and *-mycota,* meet the requirements, except that possibly they are too long. The example for the ending at the 'cohort' rank series level meets all of the requirements. The example at the 'family' rank series level is incomplete because the Zoological Code provides only for 'family' and 'subfamily' endings. The category rank series indicator is not uniform, and the suffixes are uniform and thus the criteria are not satisfied.

A comprehensive unified handling of this problem could be achieved by adopting a set of short *category rank series indicators* (not necessarily the examples given here)—

province (-vi-), phylum (-phy-), class (-si-), cohort (-co-), order (-do-), family (-mi-) and tribe (-ri-)—

and a uniform set of short *category degree indicator suffixes* which could be applied to the above—

super (-rae), basic (-ae), sub (-sae) and infra (-nae).

One example—cohort (-co-) is included in Tables 2 and 3. Such endings could be uniform for all of biology, or a separate set could be adopted for each of the plant and animal kingdoms.

5. OUTLINE HISTORY OF SYSTEMATIC BIOLOGY

In this very brief article, it will be possible to include only the barest outline of some of the highlights in the history of systematic biology as a branch of Western Culture. The student who is interested in more extensive details is referred to the selected bibliography. Biological science is a unit, and the systematic part is only one of its phases. The development of a part is bound to affect the others. Thus some of the other phases of biology will be referred to in presenting the subject of systematic biology.

(A) SYSTEMATIC BIOLOGY IN THE GRECO-ROMAN PERIOD, TO 476 A. D.

One school of early Greek philosophers working on the problem of the nature of the universe for over two centuries reached the conclusion, in the atomic theory of Leucippus (5th cent. B. C.) and Democritus (C. 460—C. 370 B. C.), that everything in the universe was made up of tiny unseen atoms, all alike, that are united by chance in various ways and numbers. The opposing school believed in a purposeful nature.

As pointed out by Darlington (1937), "It was generally held that evolution of some kind had taken place, though its comprehensive nature was not generally grasped. In regard to its mechanism a wide cleavage of opinion arose between two schools. There were on the one hand those who like Aristotle supposed that a purpose, divine or natural, worked by the inheritance of acquired characters to produce conformity with an imagined harmony of nature. On the other hand there were those who saw no purpose or design in the order of things, and conceived of living organisms as growing and changing according to determinate laws, laws which equally governed non-living things. Such a cleavage still persists today."

The study of organisms for their own sake—the basic science of biology—as distinct from technology (applied biology) began in ancient Greece. Unfortunately, the greater part of the biological work of Aristotle (385(4)—322 B. C.), who is recognized as the father of biology, and zoology in particular, has been lost to us. Works that have survived include,—"On the History of Animals" (10 books), "On

the Parts of Animals" (4 books), "On the Reproduction of Animals" (5 books), and "On the Soul" (3 books). Aristotle left his library to his pupil Theophrastus (372(0)—287 B. C.), who is recognized as the father of botany. The work, "Enquiry into Plants", attributed to him, and "The Causes of Plants", have come down to us, but the first may be a compilation from the notes taken down by scholars who attended the lectures of Theophrastus. Thus, what we know about the Aristotelian biology is partly associated with these books. Aristotle recognized only two systematic categories—'kind' and 'group'—and he recognized eight such groups for animals. The classification of animals envisioned by Aristotle was not set down in summary form, and it has been necessary to extract this from his writings. Thus it is natural that there is lack of unanimity as to what it is (Weysse, 1904; Singer, 1931—59; Bodenheimer, 1958, etc.). Such a summary for animals according to Weysse (1904) is given in Table 4.

What we know about Aristotle's views on plants comes down to us mainly through Theophrastus, and apparently the latter made contributions of his own, but he did not formalize any classification of plants. Theophrastus realized the difference between flowerless and flowering plants. He reported detailed observations on the germination of the monocotyledonous and dicotyledonous types of seeds and seedling development, citing the grasses for the former, and leguminous plants for the latter, but did not formalize any system on that basis. Thus the seed was planted that sprouted later into the outlook of Albertus Magnus (before 1256 A. D.) and Ray (1686—1704). Theophrastus also grouped plants from other viewpoints—trees, shrubs, undershrubs and herbs; deciduous and evergreen plants; and cultivated and wild plants. Thus any classification of plants on a formal basis has to be extracted from his writings. One such view is given in Table 4.

Table 4. Summary of classification of plants according to Theophrastus, and animals, according to Aristotle, as extracted from their writings.

Plants* (extracted from Theophrastus' writings)
- Flowerless
- Flowering:
  - [Monocotyledonous type]—germination of grass seeds, and seedling development, cited by Theophrastus.
  - [Dicotyledonous type]—germination of leguminous seeds, and seedling development, cited by Theophrastus.

* Classification of plants from other viewpoints: trees, shrubs, undershrubs, herbs; deciduous and evergreen; cultivated and wild.

Animals (extracted from Aristotle' writings according to Weysse, 1904)

Animals with blood:	Animals without blood:
1. viviparous animals (mammals)	5. soft animals (such as Cephalopods)
2. birds	6. soft animals with shells (such as Crustacea)
3. oviparous quadrupeds (our amphibia and reptiles)	7. insects
4. Fishes	8. animals with shells (such as Echinodermata and many Mollusca)

The crushing of the Achaean League by the Romans in 146 B. C., marked the end of Greek and Macedonian independence. However, Greek science and culture continued on as a vital influence throughout the time of the Roman Middle and Later Republics and to the end of the Empire in 476 A. D. The Romans, with a practical tradition, carried on mainly as technologists (in applied science).

The first agricultural book in Latin was produced by Cato the Censor (234—149 B. C.). In it 120 cultivated plants were mentioned.

The philosopher, reformer and poet, Lucretius (Titus Lucretius Carus, (99(8)—55 B. C.) in his great poem, "De Rerum Natura", eloquently presented the ideas of his Greek predecessors Democritus (C. 460—370 B. C.) and Epicurus (342—270 B. C.) in order to combat the superstitions of his pagan contemporaries. With reference to biology, he "tells of the existence of monstrous creatures which lived relatively early in the span of earth's history and which eventually proved unsuited to their changing environment and consequently disappeared. The poet pictures all living

creatures, including man, as springing originally from the earth, which by his time he believed to have grown old and to have passed her age of greatest fertility (Bennett, 1956)." Although his advanced ideas concerning atomic theory and evolution were scorned by the pagan Romans and later also by the Church fathers, his version of evolutionary philosophy influenced the studies of 18th century A. D. science.

In referring to the disputes between the two schools of evolution in ancient times, Darlington (1937) states that the bases of these "did not rest on the strict experimental evidence that can now be adduced but merely on observations of a world which clearly provides by its ordinary changes the means of testing many fundamental hypotheses as it still does in astronomy and cytology. From such observations emerged one theory which we ought to keep in mind because it agrees in so many respects with the views underlying modern genetics. This was the theory developed with closely reasoned argument by the atomic and materialistic philosophers and preserved for us largely in the great poem of Lucretius. It may be summarized under five heads—(1) Material bodies handed down from one generation to the next determined heredity both of body and mind. Matter being atomic, inheritance was atomic or particulate as we now call it; (2) The offspring were derived from materials of both parents, sometimes more of one than of the other, the two being therefore merely statistically equal; (3) Separation and recombination of these bodies in the course of sexual reproduction was responsible for the separation, recombination and reversion of characters; (4) Evolution occurred in the sense that some species became extinct while others changed. Man for example had developed from brutish ancestors without law or language. There was no all-embracing scheme of evolutionary change and there was equally no conception of species being fixed; (5) New structures arose by chance and survived if they were useful. Nature eliminated unprofitable types. They did not come into being for a purpose or in response to use. Aristotle thought this was leaving too much to chance, an argument that was equally to be used against Darwin."

Gaius Plinius Secundus (23—79 A. D.), commonly known as Pliny, compiled a "Natural History" about A. D. 77. Dioscorides (birth and death dates unknown), produced a "Materia Medica" about 78 A. D. This remained the standard text for students of European botany on through the Middle Ages. The anatomical works of Galen (131—210 A. D.) served as guides in medical schools for twelve centuries.

(B) SYSTEMATIC BIOLOGY DURING THE MIDDLE AGES, 476—1453

With the death of the last Roman Emperor in 476 A. D., the Roman Empire of the West also expired. There followed first a marked decline and then a gradual reawakening of interest in learning in western Europe. This period lasted until about the middle of the 15th century—nearly a millennium. During this whole period, the Aristotelian biological tradition was dominant. The works of Theophrastus, Pliny, Dioscorides, and Galen were standard, and any slight progress was built upon that basis.

Early Middle Ages, 476—1096—With the Mohammedan conquest of large areas in the Middle East, north Africa and Spain, Greek science was gradually adapted to the particular needs of the conquerors in this vast crescent. In time the Arabian and Persian philosophers made notable contributions during a period when the advance of learning in western Europe was in eclipse. Notable contributions were made by Abu Mansur, who composed a pharmacological treatise in Persian during the years 968—977 A. D. Its influence was apparently indirect since it was never translated into Arabic. The Persian, Abu Sina (980—1037), sometimes referred to under a latinized distortion of his name as Avicenna, was a noted mathematician, astronomer, philosopher and poet. His most important biological contribution was his "Canon of Medicine", which ranked not far below Galen's work.

The Age of the Crusades, 1096—1291.—The great natural philosopher Ibn-Rushd (1126—1198), sometimes called Averroes, was born at Cordoba in Spain. He made a notable advance toward a more real conception of nature. With his passing, Arabic philosophy went into decline due to religious intolerance. But Persian and Arabian philosophers had bridged the gap of the Early Middle Ages

and the torch was again taken up in western Europe during the Age of the Crusades, which is here under consideration.

The outstanding natural philosopher in the Western tradition during this time was Albertus Magnus (1193—1280). Although the great bulk of his writings are concerned with theology and philosophy, his real interest appears to have been natural science. He upheld the Aristotelian tradition as found in Theophrastus, but he apparently progressed as pointed out by Arber (1938), for the botanical part of his writings, "De vegetabilis" (dating from before 1256 A. D.) reveals that he had in mind a system of classification of his own which he never set down on parchment in summary form. This system has been summarized by modern workers as shown in Table 5.

Table 5: Classification of plants according to Albertus Magnus as extracted from his writings (Arber, 1938). See also Table 4.

1a. Leafless plants [cryptogams in part]
1b. Leafy plants [phanerogams and certain cryptogams]
  2a. Corticate plants [monocotyledons]
  2b. Tunicate plants ("ex ligneis tunicis") [dicotyledons]
    3a. Herbaceous
    3b. Woody

Present day equivalents of the groups are shown in brackets, but it should be realized that he did not recognize the distinction between monocotyledons and dicotyledons to the extent that is shown in Table 5. The influence of the biological work of Albertus Magnus extended over the next two centuries.

Roger Bacon (1214—1294) is to be remembered for his general scientific ideas which stimulated others to perform their work by the inductive scientific method.

Later Middle Ages (1291—1453).—As already intimated, the work of Albertus Magnus eclipsed all the work in Aristotelian biology until the time of Andrea Cesalpino (1519—1603). The manuscript herbals written during the Later Middle Ages were based upon Greek and Latin manuscripts and Arabic commentaries, and thus lacked originality.

(C) SYSTEMATIC BIOLOGY DURING THE MODERN PERIOD, 1453 TO PRESENT TIME

Among the factors that brought about a quickened pace in the reawakening of interest in learning during the early part of this period may be mentioned the invention of printing by movable type in 1440, and the wider dispersal of the ancient Greek manuscripts into western Europe after the fall of the Eastern Roman Empire in 1453.

EARLY MODERN PERIOD, 1453-1757

Following closely in the path of the invention of printing, popularization of knowledge began with the appearance of treatises on various subjects, including biology. In biology, there first appeared a series of herbals, and this was followed later by the appearance of texts devoted to Aristotelian biology, and also biology with a new modern outlook.

"Age of Herbals", 1470—1679.—During the so-called "Age of Herbals", printed herbals were produced in Germany, the Low Countries, Italy, Spain and Portugal, Switzerland, France and England (See Arber, 1938). During this time, the first herbaria were established, and by the 16th century, the making of such collections, including also museum specimens of animals, became a regular part of biological systematics. The herbalists include a long roster of illustrious names such as Brunfels, Fuchs, Carmerarius the Younger, L'Obel, Mattioli, Gesner, Bauhin, and so on. It is not possible to go into detail here about their contributions, except to note that Bauhin (1560—1624) was apparently among the first to fully appreciate the distinction between plant genera and species as shown in his main work, "Pinax theatri botanici" (1623). *He provided the species with descriptions, and named the genera*, but did not characterize the latter.

The works of Vesalius (1514(15)—1564?), first published in 1543 (revised edition, 1555) created the modern science of animal anatomy which is basic to systematics.

He was persecuted for his advanced ideas and driven into voluntary exile where he apparently perished. His work was vigorously, and for a long time successfully, opposed by the followers of the outmoded tradition of Galen, but gradually over the next two centuries the contributions of Vesalius were generally accepted .

During the early modern period there was also a revival of Aristotelian biology. In 1552, Wooton (1492—1555) revived the Aristotelian system of animal classification in a modified form. Two of the more important workers in botany may be mentioned. Andreas Cesalpino (1519—1603) in his "De Plantis libri xvi" (1583) insisted on the importance of the reproductive organs in plant classification, and in this he foreshadowed Linnaeus' later artificial system. Adam Zaluziansky von Zaluzian (1558—1613) in his "Methodi herbariae, libri tres" (1592) presented a survey of botany in general and pleaded for the separation of the study of botany from medicine.

The significance of the work of Harvey (1578—1667) on the circulation of blood (1628), and his work, in embryology (1651), basic to systematics, lies in fulfilling the requirements laid down by Francis Bacon (1561—1626) for explaining nature by experience based upon observation and experiment.

End of an era 1679—1757.—This period in the development of systematic biological tradition begins with the publication of the "Handbook of Botanical Study" ("Isagoge phytoscopica" (1679) of Joachim Jung (1587—1657)) published 22 years after his death by his pupils, which inaugurates the beginning of an accurate terminology and a rigorous descriptive procedure for botany, and indirectly also for biology as a whole—a clear break with the Aristotelian tradition. However, Jung's influence began 18 years earlier as will be explained below. Jung's book contains an exposition of the theory of botany and the characterization of the plant and each of its organs. He used the flower as the basis of his classification and his nomenclature approached a consistent binomial system. This work influenced workers in systematics during the rest of the period, and indirectly also workers up to the present in that all follow a similar modernized procedure. After Jung there is a definite trend in the direction of departing from a slavish adherence to the Aristotelian tradition. Ultimately any of its features are retained only because they can be verified.

Pierre Magnol (1638—1715), first proposed the concept of 'famille', stating that "plants have certain affinity which does not exist in any part considered separately, but only as a whole." However, he did not characterize any families. Joseph Pitton de Tournefort (1656—1708), a pupil of Magnol, *named and adequately described genera* in his "Institutones Rei Herbariae" (1700).

John Ray (1627—1705), who collaborated with Francis Willughby (1635—1672), in zoological research until the latter's death, proposed classifications of plants and animals which are summarized in Table 6.

In 1660, Ray luckily got hold of Jung's manuscripts of "The Handbook of Botanical Study" (1679) and "Doxoscopiae" (1662), three years after the author's death, and 19 years before the first was finally published. This profoundly influenced all of Ray's biological work, and it was through Ray that Linnaeus first came under Jung's influence.

Ray's system for animals was not practical because he used the dichotomous device of branching by two's in the presentation. Ray's largest botanical work is his "Historia Plantarum" (1686—1704). His plant classification is inferior to the conception of Albertus Magnus because Ray divides plants artificially into herbs and trees. But he did confirm Theophrastus' concept of monocotyledons and dicotyledons on the basis of seed leaves. Ray was influenced by the work of Jung with reference to rigorous definitions and terminology, and he cites Cesalpino with reference to the importance of fruits and seeds in classification, but he explains that the form of the leaves and other parts must also be considered. Ray believed in the special creation of an invariable number of species. He characterized each genus with a diagnosis, and gave detailed descriptions of the species. He based his definition of species on reproductive isolation—the unit that breeds true within its own limits.

By early 1700, in some cases, untenable parts of the Aristotelian systematic tradition had been abandoned; some valid Aristotelian concepts had been clarified

and conserved; and some new concepts had been adopted. Further developments toward the building of a modern systematic tradition, particularly the general adoption of valid principles of classification, and the recognition of the valid mechanism of evolution, were still in the future.

It is now in order to summarize *some* of the advances made toward the building up of a scientific tradition during the more than two millenia before 1700: (1) A theory of botany had been presented by Jung together with a rigorous terminology and description procedure. (2) A definition of species had been proposed by Ray. (3) Species had been adequately described by Bauhin and Ray. (4) Genera had been adequately described by Ray and Tournefort. (5) The binomial method of naming organisms—genus + specific epithet—had been used by various workers, usually not consistently—Jung, however approached consistency. (6) Theophrastus, Albertus Magnus and Ray had developed the concept of monocotyledons and dicotyledons. (7) Cesalpino had pointed out the importance of considering the characters of the reproductive organs in classification. Jung had based his classification on the flower. (8) Ray had explained that not only the characters of the reproductive organs, but also those of the vegetative parts have to be considered in classification. (9) Vesalius had founded the modern science of animal anatomy, and Harvey had published on animal embryology.

Table 6. Summary of John Ray's classifications of plants and animals. See also Tables 4 and 5.

- Plants:
  - Herbs:
    - Impertectae (mostly algae, fungi, mosses and ferns)
    - Perfectae (seed plants)
      - Monocotyledons
      - Dicotyledons
  - Trees:
    - Monocotyledons
    - Dicotyledons

- Animals:
  - Sanguiferous:
    - Lung breathers:
      - Animals with two heart ventricles:
        - Oviparous (birds)
        - Viviparous:
          - Partly land animals—mammals
          - Partly aquatic animals—whales
      - Animals with one heart ventricle:
        - Oviparous quadrupeds—(frogs, tortoises, lizards and snakes)
    - Gill breathers—fishes
  - Bloodless animals:
    - Small (insects)
    - Large (molluscs, crayfish, crustaceans)
  - Anomalous animals—(hedgehog, mole, shrew-mouse, armadillo, sloth, etc.)

All of this was *part* of the climate in the biological systematic tradition when Linnaeus (1707—1778) came on the scene. The concepts of the Aristotelian tradition were still influential, particularly the theory of design or purpose in nature. The theory of chance in the origin and evolution of organisms as initiated by Leucippus and Democritus, and their followers, and as summarized by Lucretius, was still in eclipse.

Linnaeus was imbued with the thesis that living organisms had been created according to a definite plan by a superior being, and it was to the discovery of this plan that he devoted a life of hard work. Although his metaphysical Aristotelian thesis was far removed from a scientific outlook, it did implant the concept that living organisms are part of an organized whole, and thus it laid to rest finally any idea that nature was chaotic. Linnaeus acknowledged Jung as a forerunner.

Linnaeus (1740, 1751, 1764) attempted to arrange plants according to a natural system by using as the criterion the common agreement existing between all parts of the plant, but he went no farther than to group genera under orders. He never characterized the orders which are equivalent to present day 'families'. He apparently realized that his background and training, and the underdeveloped state of botany, made it impossible for him to complete such a system, but he stated that the completion of it should be the ideal of all botanists in the future. This would explain the unfortunate compromise solution for his day that he adopted. Apparently following the suggestion of Cesalpino, and the example of Jung, he developed the artificial sexual system which he presented in the elaborated form in "Species Plantarum" (1753). An outline of this is shown in Table 7. This was

still-born from the standpoint of influencing the future development of systematics, excepting to implant the idea that biology is a unified whole as already suggested, and the incidental introduction into general use of binomial nomenclature which had not been consistently used in the past. However, this system was highly successful as a *practical* device for pigeon-holing the increasing number of newly discovered species. The Linnean method soon degenerated into the dead end street of the uninspired routine of collection and description of species and their arrangement according to the artificial system.

Linnaeus' system of animal classification as presented in "Systema naturae" (1735—58), although inadequate (see Table 7), was in the right direction towards a natural system in contrast with his artificial plant classification. He divided animals into six classes—Quadrupedia, Aves, Amphibia, Pices, Insecta and Vermes. In comparison with Ray's system this does constitute an advance.

Georges Leclerc Buffon (1707—1788) brought out the first part of his "Histoire Naturelle" in 1749, a work concerning animals upon which he was engaged for the remainder of his life. He was a contemporary of Linnaeus, but there the similarity ends. In outlook Linnaeus in a great measure represented the end of an era, but Buffon—a brilliant gadfly—had an intimation of the biology of the future. He pointed out that there is no boundary between the plant and animal kingdoms; that common to both are reproduction and growth, and that thus there was "no question of a common creative origin." He opposed Linnaeus' sexual system of plant classification, and he ridiculed Linnaeus' classification of animals, pointing out obvious inconsistencies and inadequacies.

Table 7. Outline of Linnaeus' classifications of plants and animals.

Kingdom I. Plantae

[Flowering plants]

- Class 1. Monardria (stamens one)
- Class 2. Diandria (stamens two)
- Class 3. Triandria (stamens three)
- Class 4. Tetandria (stamens four)
- Class 5. Pentandria (stamens five)
- Class 6. Hexandria (stamens six)
- Class 7. Heptandria (stamens seven)
- Class 8. Octandria (stamens eight)
- Class 9. Enneandria (stamens nine)
- Class 10. Decandria (stamens ten)
- Class 11. Dodecandria (stamens 11-19)
- Class 12. Icosandria (stamens 20 or more on calyx)
- Class 13. Polyandria (stamens 20 or more on the receptacle)
- Class 14. Didynamia (stamens didynamous—in two pairs of different lengths)
- Class 15. Tetradynamia (stamens tetradynanous — with 4 long and 2 shorter stamens)
- Class 16. Monadelphia (stamens monadelphous—united in one group)
- Class 17. Diadelphia (stamens diadelphous—united in two groups)
- Class 18. Polydelphia (stamens polydelphous—united in 3 or more groups)
- Class 19. Syngenesia (stamens syngenesious — united by their anthers)
- Class 20. Gynandria (stamens united to the gynoecium)
- Class 21. Monoecia (plants monoecious)
- Class 22. Dioecia (plants dioecious)
- Class 23. Polygamia (plants polygamous)

[Flowerless plants]

- Class 24. Cryptogamia (flowerless plants)

Kingdom II. Animalia:

A. Heart with 1 or 2 ventricles and 2 atria; blood warm and red:
  - (a) Viviparous . . . . Class 1. Quadrupedia
  - (b) Oviparous . . . . Class 2. Aves

B. Heart with 1 ventricle and 1 or 2 atria; blood cold and red:
  - (a) Breathing by lungs . . . . Class 3. Reptilia
  - (b) Breathing by gills . . . . Class 4. Pices

C. Heart with one ventricle and no atrium; blood cold and colorless:
  - (a) With antennae . . . . Class 5. Insecta
  - (b) With tentacles . . . . Class 6. Vermes

MIDDLE MODERN PERIOD, 1757—1859 (NATURAL SYSTEMS)

In 1757, the philosopher, scientist and encylopedist Michel Adanson (1 1806), who is recognized as the father of 'natural' classification, publishe "Histoire naturelle du Senegal". In this he first enunciated the principle which the 'natural' system of classifying organisms is based. Later he ga definitive formulation of the principle in his "Familles des Plantes" (1763-64) systematics as a theoretical science came of age. He was so far ahead of his that the full significance of his contribution to theoretical systematics was appreciated until the lapse of two centuries when Sneath applied the Adanso multivariate method to the classification of bacteria, including the use of electr computers (Sneath, 1957a & 1957b). See also Michener & Sokal (1957) and I Rogers (1961).

Adanson proposed that every feature of the organism be given equal weigh arriving at valid taxonomic groupings as contrasted with Linnaeus' use of one a few selected sexual characters in making his artificial sexual system. By method Adanson would achieve some measure of overall similarity, an idea suggested in embryo by Magnol in the 'famille' concept; followed by R suggestion that not only the sexual but also the vegetative characters are to be u in classification; and Linnaeus' similar suggestion that any natural system sho be based on the common agreement existing between various parts of the pla In 1757, the situation was similar to that which existed with reference to the the of evolution later. Some pre-Darwinians from ancient times onward believed in theory of evolution, but Darwin discovered the all important mechanism of evo tion. Some pre-Adansonians had sensed that a group of characters should be us in classification, but it was the genius of the philosopher and scientist Adanson whi first perceived the multivariate principle in arriving at 'natural' groups.

Adanson's multivariate principle for the classification of organisms was n fully understood in his time, and his important contribution to theoretical syst matics was not utilized to its fullest extent. The workers who believed in th 'natural' system, including his contemporaries and those who came after him, trie to use both sexual and vegetative characters in classification, and thus they wer in a measure Adansonian systematists.

In his "Familles des Plantes" (1763-64), Adanson applied his method in th grouping of plants into families which gave a very stable nomenclature. In thi work he described 58 plant families *for the first time*. An estimate of the validity of his method may be gauged by noting in Table 8, that of Adanson's families of flowering plants, 34 are still recognized under the names he gave them, and that others are valid but are now parading under different names. It is to be noted that Bauhin and Ray first described species, Tournefort and Ray first described genera, and Adanson described families for the first time.

Adanson did not attempt to apply his method to the forming of groups above the familial level and this confused most of his contemporaries and also later workers who equated progress with the presentation of some sort of system, any system. What he did do was to provide a valid guiding principle for the grouping on all levels of the hierarchy from the lowest to the highest. It is regrettable that many of his contemporaries and later workers did not understand Adanson and his work, and allowed his memory to lapse into semi-obscurity.

It is a sad commentary on human nature that it is necessary to note that Adanson was the victim of deliberate persecution, and that he was never given the opportunity of fully developing his vast talents; and that during the Revolution he almost starved to death (see Chevalier. 1934; Glass, 1959). This recalls a somewhat similar fate suffered by Vesalius and some other pioneers in science.

A. L. de Jussieu (1748—1836), in his "Genera Plantarum" (1789), appropriated most of the families *first described by Adanson* without giving due credit, calling them "orders", but he did increase the number to 100, using an abbreviated Adansonian principle in doing so. Many of Jussieu's added "orders" (= families) have endured. Unfortunately, Jussieu, who succeeded to his post at the Jardin des Plantes in Paris by nepotism (see Chevalier, 1934, Glass, 1959)—a post that rightfully belonged to Adanson—was not intellectually honest. He deliberately suppressed the truth about Adanson's contributions toward the first description of

Table 8. Families of flowering plants **first described** by Adanson (1763) and still recognized by Gunderson (1950) and/or Hutchinson (1959). Arranged in the order in which they appear in Adanson's work. Endings according to Art. 18, Int. Code (Lanjouw et al, 1956).

Palmae Adans.	**Verbenaceae** Adans.
Gramineae Adans.	**Solanaceae** Adans.
Liliaceae Adans.	**Portulacaceae** Adans.
Zingiberaceae Adans.	**Amaranthaceae** Adans.
Orchidaceae Adans.	**Thymelaeaceae** Adans.
Aristolochiaceae Adans.	**Rosaceae** Adans.
Eleagnaceae Adans.	**Leguminosae** Adans.
Onagraceae Adans.	**Annonaceae** Adans.
Myrtaceae Adans.	**Tiliaceae** Adans.
Umbelliferae Adans.	**Geraniaceae** Adans.
Compositae Adans.	**Malvaceae** Adans.
Campanulaceae Adans.	**Cappariaceae** Adans.
Caprifoliaceae Adans.	**Cruciferae** Adans.
Vacciniaceae Adans.	**Papaveraceae** Adans.
Apocynaceae Adans.	**Cistiaceae** Adans.
Boraginaeae Adans.	**Ranunculaceae** Adans.
Labiatae Adans.	**Araceae** Adans.

plant families, and during the rest of his life attempted to downgrade the outstanding achievements of Adanson. In this sinister plan Jussieu succeeded only too well—many who read these lines have been kept from knowing the facts even to the year 1962.*

Jussieu's major taxonomic groups are Acotyledones, Monocotyledones and Dicotyledones, which apparently were borrowed from Ray's "Historia Plantarum" (1686—1704), and which he improved by eliminating the grouping under herbs and trees as shown in Table 9.

Table 9. Abbreviated classification of plants according to Jussieu (1789), with indication of probable derivation of the major taxonomic groups. See also Table 4.

Jussieu (1789)	Albertus Magnus (before 1256 A. D.) See Table 5.	Ray (1686-1704) See Table 6.
Acotyledones (fungi, Algae, Musci)	I. Leafless plants	I. Imperfactae
	II. Leafy plants	II. Perfactae (herbs & trees)
Monocotyledones	'Corticate Plants'	Two groups (herbs & trees) of monocotyledons
Dicotyledones	'Tunicate Plants' "ex ligneis tunicis"	Two groups (herbs & trees) of dicotyledons

Under the three major headings he recognized a total of 15 classes. Under the classes he grouped the orders (= families). The classification within the framework between the three major groups and the orders (families) is highly artificial

* The Bicentenary of the publication of Adanson's "Familles des Plantes" (1763-64) will be celebrated in 1963-64. An evaluation of Adanson's contributions to science will be included in an "Adanson Memorial" volume.

There is a new movemest afoot to by-pass the rightful claims of Adanson in the attempt to designate Jussieu's "Genera Plantarum" (1789) as the sole starting point of plant families. However, the only just and decent procedure is to designate Adanson's "Familles des Plantes" and Jussieu's "Genera Plantarum" jointly as the starting points of plant families, and thus avoid a gross injustice. The Adanson and Jussieu family names that are in general use could remain standard, and later names by others superceding Adanson and Jussieu family names, and in general use, could be conserved. One index showing that Adanson's genius is finally widely appreciated is revealed in the recent purchase by the Hunt Botanical Library, Pittsburgh, Penna., of the residue of the Adanson papers formerly housed at the family home at Baleine in France. In their new home they will be available to students.

and not in harmony with the tradition of any 'natural' system. The workers during the next half century greatly modified Jussieu's system for the better so that they became in fact new systems, retaining only the ancient conceptions of acotyledons, monocotyledons and dicotyledons in new relationships. Jussieu's lasting contribution is therefore in connection with natural families of plants, an honor which he has to share jointly as a junior partner with Adanson who first described many of those which Jussieu appropriated without giving credit to the source.

Robert Brown (1773—1858), who had adopted the natural system in presenting his work, "Botany of Terra Australia" in 1814, set the general trend toward ignoring the artificial Linnean system which was carried on by faithful followers for a considerable time into the 19th century. Thus the Linnean system was doomed to a lingering decline and death. Robert Brown is also to be credited with the first recognition of the gymnosperms.

The most celebrated systematists of the first half of the 19th century were the Candolles. Pyrame de Candolle (1778—1841) is noted for the publication of his "Theorie elementaire" (1813) in which he detailed his concepts about plant classification, and for initiating the great work, "Prodomus systematis naturelle regni vegetabilis". He had adopted the natural system (see Table 10), and it was his object to describe and classify all species of plants. During his lifetime he published seven volumes starting in 1824. The work was continued by his son, Alphonse de Candolle (1806—1893), in collaboration with others, and an additional 10 volumes were published, the last in 1873. Various other systems were proposed during the first half of the 19th century, but the Candolle system was supreme on into the early years of the next period.

The outstanding "Genera Plantarum" (1836—40) of Endlicher (1805—1849) is to be noted. He grouped the plant Kingdom into "Thallophytes" (algae, lichens and fungi) and "Cormophytes" (mosses, ferns and seed plants), a notable advance over previous systems.

Brongniart (1770—1847), the founder of paleobotany, divided dicotyledons into gymnosperms and angiosperms. This feature was adopted by Lindley (1799—1865) in his "natural System of Botany" (1830). It is also to be noted that Alexander Braun (1805—1877) subordinated monocotyledons and dicotyledons under angiosperms.

Table 10. An outline of the Candolle system as of 1819.

I. Vasculares (vascular plants, with cotyledons)
  Class 1. Exogenae (vascular bundles in a ring: dicotyledons)
      [artificial classification under this head]
  Class 2. Endogenae (vascular bundles scattered: monocotyledons, etc.)
      A. Phanerogamae (flowers present), Lilaceae, etc.
      B. Cryptogamae (flowers absent, hidden, or unknown), ferns, etc.
II. Cellulares (plants without vascular bundles or cotyledons)
  Class 1. Foliaceae (mosses, liverworts)
  Class 2. Aphyllae (not leafy; sexuality unknown), algae, fungi, lichens.

The Chevalier de Lamarck (1744—1829) was entirely self taught and a hack writer until he took up the study of zoology by accident after he reached the age of fifty years. He was a thinker in his own right and was chiefly influenced by Buffon, Bonnet (1720—1793) and Cuvier (1769—1832), the founder of modern comparative zoology. By sheer genius he made outstanding contributions in zoology. His most important publications are "Philosophie zoologique" (1809) and

Table 11. An outline of Lamarck's classification of animals as of 1815-1822.

I. Vertebrates:	Invertebrates (continued)
1. Vertebrata	6. Arachinda
II. Invertebrates:	7. Insecta
2. Mollusca	8. Vermes
3. Cirripedia	9. Radiata
4. Annelida	10. Polypi
5. Crustacea	11. Infusoria

"Histoire naturelle des animaux sans vertèbres" (1815—1822). He proposed his well-known theory of evolution by means of acquired characters, and elaborated a system of animal classification that represented an extraordinary advance over that of Linnaeus. Lamarck recognized eleven 'natural' groups in contrast with the six of Linnaeus as shown in Table 11. It will be noted that he divided animals into vertebrates and invertebrates.

Malthus (1766—1834) had published his essay on population as early as 1803. The great popularizer Robert Chambers (1802—1870) had published his "Vestiges of the Natural History of Creation" anonymously in 1844, summarizing circumstantial evidence, which was often downright erroneous, for a belief in organic evolution. But the mechanism for the evolutionary process was lacking. Thus the ground was prepared for the next great advance in the development of biology.

On July 1, 1858, in the best tradition of scientific integrity, a joint paper by Charles Darwin and Alfred Russell Wallace was read before the Linnean Society in London. The paper was on the subject of the evolution of species by means of natural selection, and was read in the absence of the authors. Darwin had worked on the problem for many years but had delayed publication of his conclusions. When Wallace independently, in a flash, reached similar conclusions, and had communicated them to Darwin, it was arranged by mutual friends to communicate the views of both scientists jointly. This leads directly to the beginning of the Later Modern Period with the publication of Darwin's monumental book on the same subject.

LATER MODERN PERIOD, 1859 TO PRESENT TIME—PHYLOGENETIC SYSTEMS

Charles Darwin (1809—1892) published his "Origin of Species by Means of Natural Selection" in 1859. Although the thesis as indicated in the title was not generally accepted at once, prominent scientists in England and elsewhere soon declared their adherence to it, including J. D. Hooker (1817—1911), Thomas Henry Huxley (1825—1895), Asa Gray (1810—1888), Ernst Heinrich Haeckel (1834—1919), and others. Although Gregor Mendel (1822—1884), the father of the science of genetics, and Charles Darwin were contemporaries, the faulty communication then existing between scientists prevented the latter from making use of Mendel's particulate theory of inheritance (Mendel, 1866) in later editions of the "Origin of Species". By this regrettable accident, Darwin had to fall back on an untenable device in the Lamarckian tradition to explain the mechanics of mutation. It was not until after 1900 that Mendel's contributions and those subsequently built on this base were integrated into a more complete theory of organic evolution (see Hardin, 1959; Strauss, 1960).

It is obvious that the theory of organic evolution by means of natural selection is not in conflict with the 'natural' method of plant classification, but is rather complementary to it. Now it was possible to explain on a phylogenetic basis how the natural groups originated. It was easy therefore to make a gradual transition from the 'natural' to the 'phylogenetic' systems.

The Candolle natural system was the one most widely accepted at the beginning of this period, but Bentham & Hooker published their "Genera Plantarum" from 1862 to 1883. This system was patterned on the Candolle system.

In the year that the last parts of the Bentham & Hooker system were published, the outstanding system of August Wilhelm Eichler (1839—1887) was proposed. This is summarized in Table 12.

The Eichler system recognized thallophyte, bryophyte, pteridophyte, gymnosperm and angiosperm groups. Through various transformations this is the basis of most of the systems proposed since 1883. The well-known "Natuerlichen Pflanzenfamilien" of Engler (1844—1930) is based on the Eichler system. The Engler classification is most widely used at the present time, not because it is the most desirable, but for the reason that it is the one most nearly completed. Once a system has been adopted by any institution, it is difficult to make a change. The first edition of the Engler system, 24 volumes, was completed from 1887 to 1915; the second edition, started in 1924, has not been completed.

A number of other systems have been proposed, but in this brief paper which is becoming far too long already, it is possible only to mention the names of some

of those who have made notable contributions in this field—Charles Edwin Bessey (1845—1915), Richard von Wettstein (1862—1931), Hans Hallier (1868—1932), John Hutchinson (1884—), and Carl Scottsberg (1888—).

Table 12. Outline of plant classification according to Eichler (1883)

A. Cryptogamae
- Division I. Thallophyta
  - Class 1. Algae (Cyanophyceae, Chlorophyceae, Phaeophyceae, Rhodophyceae)
  - Class 2. Fungi
- Division II. Bryophyta
  - Class 1. Hepaticae
  - Class 2. Musci
- Division III. Pterophyta
  - Class 1. Equisetineae
  - Class 2. Lycopodineae
  - Class 3. Filicineae

B. Phanerogamae
- Division I. Gymnospermae
- Division II. Angiospermae
  - Class 1. Monocotyleae
  - Class 2. Sympetalae

One of the workers in the field of zoology who was inspired by Darwinism was Haeckel, already mentioned. He was the authority on Radiolaria, sponges and Medusae. He declared his adherence to Darwinism early (Haeckel, 1862). He was dominated by the monistic philosophy which had its roots in the Neo-Platonic stream of thought developed in the Middle Ages (Wulf, 1922; Nordenskiold 1949) as contrasted with the scholastic tradition that developed into the modern Western tradition. In spite of his "fuzzy" outlook due to monism, which invalidated much of his work, Haeckel did make lasting contributions. He coined terms that we all use today: 'ontogeny', the individual's development; 'phylogeny', the race's development, and 'oecology' (ecology), the relation of organisms to their environment. In his systematic work, Haeckel (1894) proposed a four-kingdom system in contrast with the usual two-kingdom systems proposed before Darwin,—Kingdom I Protophyta, Kingdom II. Protozoa, Kingdom IV. Metaphyta, and Kingdom IV. Metazoa.

It now remains to summarize briefly, the systems actually taught in the schools and colleges at the turn of the century, and the most recent developments in the classification of organisms.

When the writer came on the scene, systems similar to the ones summarized in Table 13 were presented to the student. It should be noted that the example shown for plants resembles the Eichler system of 1883. The system for animals represents a marked improvement over that of Lamarck in 1815—1822.

Haeckel's 1894 four-kingdom system has already been noted. More recently four- three- two- and one-kingdom systems have been offered. The student should not take the increase in kingdoms in a single system too seriously because the naming of more kingdoms does not change the actual relationships among organisms. Those who make more kingdoms are honestly convinced that this change will express the relationships more accurately.

Copeland (1938; 1956) Barkley (1939) and Rothmaler (1948) have proposed four-kingdom systems. Three-kingdom systems have been suggested or proposed by D. P. Rogers (1948), Simpson et al (1957), Whittaker (1959), and others. Two-kingdom systems, with details for plants only, have been proposed by Pascher (1931), Tippo (1942), Cronquist (1960), and others. One-kingdom systems have been proposed by Walton (1930) and Dillon (1957). Two examples of each of three- and two-kingdom systems will be briefly considered here.

The Simpson et al. (1957) three-kingdom system (Table 16) is based on the premise that the *Protista* cannot be classified definitely with either plants or animals, and the organisms included may be considered as plant-like or as animal-like depending on what part of their structure, or what phase of their functioning, one may be considering. If one accepts this premise, then this type of system is in order. It is all in the point of view.

D. P. Rogers (1948), on the basis of evolutionary tendencies in plants, fungi and animals, suggested that each be recognized as a kingdom, but he did not elaborate any system.

Table 13. Outline of typical classifications of the phyla (divisions) of organisms as presented in high schools and colleges at the end of the 19th century. Plantae according to Bergen & Davis (1906) and Animalia according to Thomson (1895).

Kingdom I. Plantae (according to Bergen & Davis, 1906)
- Division I. Thallophyta:
  - Series of the Algae:
    - Class 1. Cyanophyceae
    - Class 2. Chlorophyceae
    - Class 3. Phaeophyceae
    - Class 4. Rhodophyceae
  - Series of the Fungi:
    - Class 5. Schizomycetes (bacteria)
    - Class 6. Saccharomycetes (yeasts)
    - Class 7. Phycomycetes (alga-like fungi)
    - Class 8. Ascomycetes (sac fungi)
    - Class 9. Basidiomycetes (basidia fungi)
- Division II. Bryophyta:
  - Class 1. Hepaticae (liverworts)
  - Class 2. Musci (mosses)
- Division III. Pteridophyta (ferns and their allies, or pteridophytes):
  - Class 1. Filicineae
  - Class 2. Equisetineae
  - Class 3. Lycopodineae
- Division IV. Spermophyta (seed plants, or spermatophytes):
  - Subdivision 1. Gymnospermae (gymnosperms)
  - Subdivision 2. Angiospermae (angiosperms):
    - Class 1. Monocotyledoneae
    - Class 2. Dicotyledoneae

Kingdom II. Animalia (according to Thomson, 1895)
- Subkingdom I. Protozoae
  - Phylum 1. Protozoa
- Subkingdom II. Metazoae
  - Phylum 2. Porifera
  - Phylum 3. Coelenterata
  - Phylum 4. Annelida
  - Phylum 5. Brachiopoda
  - Phylum 6. Nematoda
  - Phylum 7. Platyhelminthes
  - Phylum 8. Echinodermata
  - Phylum 9. Arthropoda
  - Phylum 10. Mollusca
  - Phylum 11. Chordata

The examples (Tables 14 and 15) of the two-kingdom systems chosen for comment represent two extremes. In both the animal kingdom part is not elaborated.

Pascher (1931) and Tippo (1942) have proposed somewhat similar systems. The composite system of Tippo (1942), presented in outline form, is based on the presentation of non-vascular plants by G. M. Smith (1938) plus the *Schizomycota;* and the contributions of A. J. Eames (1936) on vascular plants. This system has much to commend it, particularly in the grouping under embryophytes where only two phyla are recognized—*Bryophyta and Tracheophyta.* On the premise that the phylum is a rather elevated rank just below the kingdom, the present writer agrees that the number of phyla under the vascular embryophytes should be greatly restricted, and that certain groups sometimes recognized as phyla could be given lower ranks without doing violence to the basic facts. Thus this solution is in the right direction. However, continuing research in paleobotany will undoubtedly affect the placement of the sub-groups (see H. N. Andrews, 1962). The student should realize that the classification of organisms will never lead to an entirely static system. It is true that certain parts of it will have general acceptance in time, but other parts will always remain subject to change on the basis of continuing research and experiment.

In contrast to the Tippo (1942) system, that of Cronquist (1960) recognizes eight coordinate phyla (divisions) under *Embryophytae.* This represents the other extreme. The student should note these two schools of thought when considering other systems, always recognizing that the phylum represents a really major group, and that it should not be used for lesser taxa.

It should be noted that all of these systems (Tables 13, 14, 15 & 16) follow the lead of the Eichler system of 1883 (see Table 12) and later systems, and do not measure up to the criterion set forth at the beginning of this section—that any arrangement of the phyla of organisms should reveal, on the phylal level, *all of the major kinds* of organisms. The student who is confronted with such systems will receive no inkling of two great groups of organisms—the chemoautotrophs and the bacterial photoautotrophs which are hidden in some other major group, usually in the catch-all group of the *Schizomycota.* Such a catch-all includes bacterial photoautotrophs, chemoautotrophs, and heterotrophs and is surely not a phylogenetic

Table 14. Classification of organisms—two-kingdom system summarized from Tippo (1942).

[**Kingdom I. PLANTAE**]
Subkingdom I. THALLOPHYTA
Phylum 1. EUGLENOPHYTA
Phylum 2. CYANOPHYTA (blue-green algae)
Phylum 3. CHLOROPHYTA (green algae)
Phylum 4. CHRYSOPHYTA (yellow-green and golden brown algae, and diatomes)
Phylum 5. PHAEOPHYTA (brown algae)
Phylum 6. RHODOPHYTA (red algae)
Phylum 7. PYRROPHYTA (cryptomonads and dinoflagellates)
Phylum 8. SCHIZOMYCOPHYTA (bacteria)
Phylum 9. MYXOMYCOPHYTA (slime molds)
Phylum 10. EUMYCOPHYTA (true fungi)

[**Kingdom I. PLANTAE**]—continued
Subkingdom II. EMBRYOPHYTA
Phylum 11. BRYOPHYTA (mosses and liverworts)
Phylum 12. TRACHEOPHYTA (Tracheata)
Subphylum 1. Psilopsida
Subphylum 2. Lycopsida
Subphylum 3. Sphenopsida (Equisetopsida)
Subphylum 4. Pteropsida
Class 1. Filicinae (ferns)
Class 2. Gymnospermae
Subclass 1. Cycadophytae
Subclass 2. Coniferophytae
Class 3. Angiospermae
Subclass 1. Dicotyledoneae
Subclass 2. Monocotyledoneae

[**Kingdom II. ANIMALIA**] not elaborated.

Table 15. Classification of organisms—two-kingdom system summarized from Cronquist (1960).

[Kingdom I. PLANTAE]	[**Kingdom I. PLANTAE**]—continued
Subkingdom I. THALLOPHYTA	Subkingdom II. EMBRYOPHYTA
*Division 1. SCHIZOPHYTA (bacteria and Cyanophyceae	Division 9. BRYOPHYTA
Division 2. RHODOPHYTA	Division 10. PSILOPHYTA
Division 3. CHLOROPHYTA	Division 11. LEPIDOPHYTA (Lycopodiae)
Division 4. EUGLENOPHYTA	Division 12. CALAMOPHYTA (Equisetae)
Division 5. PYRROPHYTA	Division 13. FILICOPHYTA
Division 6. CHRYSOPHYTA	Division 14. CONIFEROPHYTA
Division 7. PHAEOPHYTA	Division 15. CYCADOPHYTA
Division 8. FUNGI	Division 16. ANTHOPHYTA
Subdivision 1. Myxomycotina	Class 1. Dicotyledonae
Subdivision 2. Eumycotina	Class 2. Monocotyledonae
	[**Kingdom 2. ANIMALIA**] —not elaborated

* 'Division' is equivalent to 'Phylum' as used in other tables.

group. The time has surely arrived when this problem has to be faced squarely, and it will be discussed in the final part of this paper.

With reference to the animal phyla, the more recent monumental work of Hyman (1940-59), on which the grouping in Table 21 is based in part, and the presentation of Simpson et al. (1957), outline shown in Table 16, are to be noted. These show a remarkable improvement over the system of Lamarck (1817-22), and the one shown in Table 13, with which the student at the turn of the century had to be satisfied.

Contemporary era.—Beginning in the early 1940's the climate apparently was favorable for new developments in systematics. This movement culminated in the organization of The Society for the Study of Evolution in March of 1946 for the integration of the various fields of science concerned with evolution. Under its influence, a new systematics, based on the latest basic research—for biology as a whole—is emerging in the procedural tradition of the geneticists, ecologists, virologists, etc., in their respective fields. Specialization by the workers is necessarily the basis of such a procedure, but through the new agency the workers are kept informed on what the other specialists are accomplishing in one comprehensive science of systematics. This new outlook is reflected in the outstanding reports and treatises that have appeared since 1940. A partial selection of these is included in the selected bibliography at the end of this article.

6. THE PHYLA OF ORGANISMS

It now remains to present a summary of the classification of organisms started in the 1910's for the writer's own use and revised over the years when time permitted. An attempt has been made to account for the origin of the kinds of heterotrophs on a theoretical basis; to resolve the inconsistency in the usual classifications with respect to the criteron of habits of nutrition; to characterize the major kinds of life on the phylal level; to give enough detail to show something about the writer's basic ideas about the postulated phylogenetic relationships, and to consider life as a whole so as to present a balanced system.

ORIGIN OF HETEROTROPHIC LINEAGES

Lineages of organisms, unless they are extinct, do not stand still but are continually subject to evolution by natural selection. In accordance with the principle of irreversibility in evolution, all future evolution is built on the base of residues of past evolution. A corollary of this principle may be expressed as the 'decreasing plasticity principle':

> The plasticity of lineages of organisms for the capacity of giving rise to new lineages by mutation with uniqueness, relatively unencumbered by the residues of past evolution, decreases markedly with time once distinctive patterns in structure and functioning have evolved.

Table 16. Classification of organisms—three-kingdom system summarized from Simpson et al (1957).

Kingdom I. PROTISTA (protists)
- Phylum 1. SCHIZOMYCETES (bacteria)
- Phylum 2. MASTIGOPHORA (flagellates)
- Phylum 3. SARCODINA (rhizopods)
- Phylum 4. SPOROZOA (**Plasmodium**)
- Phylum 5. CILIOPHORA (Classes Ciliata and Suctoria)
- Phylum 6. MYXOMYCETES (slime molds)

Kingdom II. PLANTAE (plants)
- Phylum 7. MYXOPHYTA (blue-green algae)
- Phylum 8. CHLOROPHYTA (green algae)
- Phylum 9. CHRYSOPHYTA (yellow-green and golden-green algae)
- Phylum 10. PHAEOPHYTA (brown algae)
- Phylum 11. RHODOPHYTA (red algae)
- Phylum 12. MYCOPHYTA (fungi)
- Phylum 13. BRYOPHYTA (liverworts, hornworts and mosses)
- Phylum 14. TRACHEOPHYTA (vascular plants)

Kingdom III. ANIMALIA (animals)
- Phylum 15. PORIFERA (sponges)
- Phylum 16. COELENTERATA (coelenterates)
- *Phylum 17. GRAPTOLITHINA (graptolites)
- Phylum 18. CTENOPHORA (comb jellies)
- Phylum 19. PLATYHELMINTHES (flatworms)
- Phylum 20. MESOZOA (**Rhopalura**)
- Phylum 21. NEMERTEA (ribbon worms)
- Phylum 22. NEMATODA (round worms)
- Phylum 23. NEMATOMORPHA (horsehair worms)
- Phylum 24. ACANTHOCEPHALA (spiny-headed worms)
- Phylum 25. KINORHYNCHA (Echinoderes)
- Phylum 26. TROCHELMINTHES (Classes Rotifera and Gastrotricha)
- Phylum 27. BRYOZOA (sea mosses or moss animals
- Phylum 28. BRACHIOPODA (brachipods and lampshells)
- Phylum 29. PHORONIDEA (**Phoronis**)
- Phylum 30. CHAETOGNATHA (arrow worms)
- Phylum 31. MOLLUSCA (mollusks)
- Phylum 32. ANNELIDA (segmented worms)
- Phylum 33. ARTHROPODA (arthropods)
- Phylum 34. ECHINODERMATA (echinoderms)
- Phylum 35. CHORDATA (chordates)

* Extinct phylum

This principle is important in considering the foundation of any classification of organisms. Since there is no fossil record of very early organisms, it is necessary to rely on theory based on the functioning of the evolutionary process in later times to account for the kinds of heterotrophic organisms evolved during this period. It is reasonable to assume that the mechanism of evolution has been similar throughout the time that it has been and is operative now. It is only on this basis that we may have any reasonable explanation of divergence during the early and intermediate stages in the history of life.

The 'decreasing plasticity principle' can explain on a theoretical basis how animals, plants and intermediate lineages of organisms may have evolved from the same initial ancestral stock. Figure 1 shows a generalized diagram to illustrate the origin of the kinds of evolving heterotrophic lineages, in different time frames, from the evolving autotrophic lineages .

The ancestral autotrophic stock is indicated at A, in Fig. 1 (see also Fig. 2). The lineages fanning out from it in the triangle ABC represent an indefinite number of evolving autotrophic lineages terminating in the surviving autotrophic groups along the horizontal line BC. See autotrophic phyla 1—16, Fig. 2; and Table 21.

Apparently the first animal-like (heterotrophic) lineage or lineages originated from primitive, relatively undifferentiated autotrophic lineages (D, in Fig. 1.) early in the history of life before distinctive patterns in structure and functioning, other than the primitive autotrophic nutrition, had evolved. Secondary heterotrophic lineages fanned out from this beginning and continued to evolve. These are now recognized as the animal phyla—DEF in Fig. 1 (see also Fig. 2; and Table 21). The initial autotrophic lineages (at D, in Fig. 1) were apparently relatively unencumbered by residues from past evolution and thus were more plastic. This made it possible for one or more unique animal-like (heterotrophic) lineages to make their appearance by mutation. By natural selection among the secondary heterotrophic lineages the unicellular animal-like, and multicellular animal lineages (DEF, in Fig. 1) evolved, with surviving groups represented in the horizontal line EF. These *early appearing* heterotrophs may appropriately be named 'archiheterotrophs Phyla 20—43 in Fig. 2, and Table 21.

Evolution is a continuous process and heterotrophic lineages originate during the entire history of the autotrophic lineages, but as the residues from past evolution increase with time, future autotrophic lineages become less and less plastic from the standpoint of capability of giving rise to relatively unique patterns by mutation, uncolored by past evolution. Thus, during an early intermediate (not a middle) period, still in the relatively early history of life, heterotrophic lineages originating from the autotrophic lineages would be slightly conditioned by residues accumulated through evolution toward the characteristic plant-like lineages. These could contribute some plant-like patterns of anatomy and/or functioning which could be colored by animal-like mutations (essentially dependent feeding, including food ingestion) and thus the intermediate phyla might have originated, GHI in Fig. 1. Such organisms having both plant-like and animal-like characteristics might explain the origin of the phyla in the Kingdom *Heteroplantae* (other feeding plants), phyla 17—19, in Fig. 2, and Table 21. These intermediate lineages may be named 'mesoheterotrophs'. Some of these are practically unknown to the general reader—most heterotrophic bacteria and the slime molds—but some of the larger local fungi are better known.

Returning to the ancestral autotrophic lineages as indicated by ABC in Fig. 1, it is to be noted that there are five series (Fig. 2 and Table 21) when considered on the basis of the development of the plant body which is one index of residues from past evolution: (1) the microscopic unicellular *Chemoautotrophae;* (2) the phyla *Chromobiophyta, Chlorobiophyta, Cyanophyta, Euglenophyta, Chrysophyta* and *Pyrrophyta* which show no marked development of the plant body; (3) the phyla *Phaeophyta* and *Rhodophyta* with marked development of the plant body along unique lines; (4) the phylum *Chlorophyta* with some development of the plant body; and (5) the *Embryophytae* with usually marked development of the plant body. In addition to such residues from past evolution, there are various other kinds of residues—morphological and functional patterns—in each of the five series.

It is among these autotrophic lineages that the evolution of a third kind of heterotrophic lineages is to be noted. After the period when the mesoheterotrophic lineages evolved, and continuing on to the present time, when the plant-like structural and functioning patterns have been well-established, heterotrophic lineages (JKL, in Fig. 1) have and are still evolving. These are so conditioned by the rigid patterns of the autotrophic lineages at these stages as briefly indicated above, that the mutant heterotrophic lineages resemble the autotrophs in all except the dependent feeding habit. At this stage the 'decreasing plasticity principle' can be verified experimentally. For instance, *Astasia longa* is identical with a colorless strain of *Euglena gracilis* that appeared in cultural experiments and has been renamed *E. gracilis* forma *hyalina* (Pringsheim, 1948). It is like the autotrophic lineage from which it evolved in all characters excepting the dependent (heterotrophic) feeding habit. From the phylogenetic standpoint such lineages do belong with or near the autotrophic lineages from which they originated, and they are in practice correctly classed with them—Phyla 1—16, see Fig. 2; and Table 21. These *late appearing* heterotrophs may be called 'neoheterotrophs'. The mutant *Euglena gracilis* forma *hyalina* is in fact one example of such neoheterotrophs. Some of the others are familiar to most readers—the neoheterotrophic parasitic dicotyledons—Dodder (*Cuscuta*), *Mistletoe* (*Viscum*), *Monotropa*, etc. Others are relatively unknown—the neopheterotrophic (saprophytic) iron bacterium *Siderobacter;* the neophotoheterotrophic (saprophytic) *Rhodomicrobium*, etc.

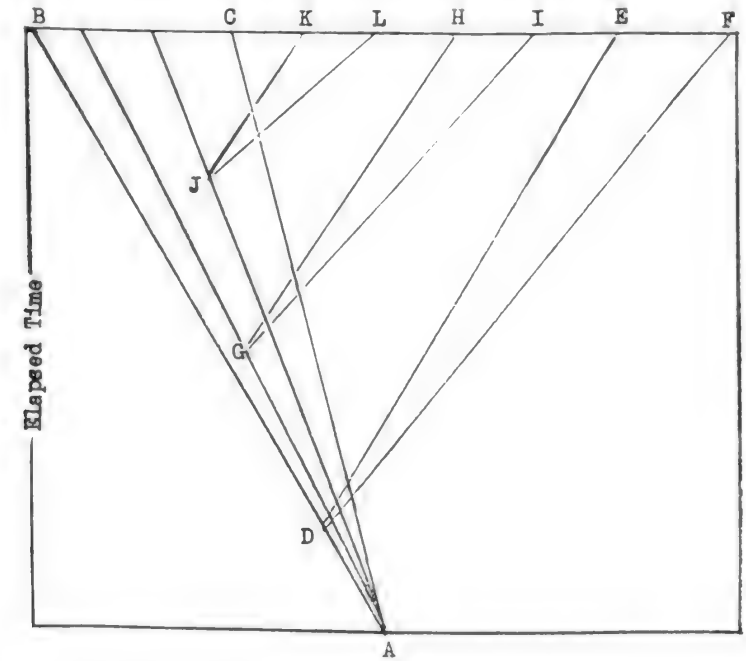

Fig. 1. A generalized diagram showing evolving lineages plotted against elapsed time, to illustrate the origin by mutation and subsequent natural selection of 'early', 'intermediate' and 'late' evolving heterotrophic lineages from evolving autotrophic ancestral lineages, in accordance with the 'decreasing plasticity principle'. The evolving lineages in each case are characterized by the increasing accumulation of residues from past evolution. Compare with Fig. 2, for application of the principle.

A—origin of life; the lineages fanning out from it in the triangle ABC represent an indefinite number of evolving autotrophic ancestral lineages terminating in the surviving autotrophic groups along the horizontal line BC. See autotrophic phyla 1—16, Fig. 2 and Table 21; and text discussion.

DEF—represents an indefinite number of mutant evolving heterotrophic lineages that appeared *early* in the history of life before few if any diversities had accumulated from past evolution (*archiheterotrophs*). See archiheterotrophic phyla 20—43, Fig. 2; and Table 21; and text discussion.

GHI—represents an indefinite number of mutant evolving heterotrophic lineages that appeared at an *intermediate* period in the history of life when some diversities had accumulated from past evolution (*mesoheterotrophs*). See mesoheterotrophic phyla 17—19, Fig. 2, and Table 21; and text discussion.

JKL—represents an indefinite number of mutant evolving heterotrophic lineages that appeared *late* in the history of life after marked diversification had appeared from residues of past evolution (*neoheterotrophs*). Neoheterotrophs are classified with the autotrophs—phyla 1—16, Fig. 2, and Table 21—from which they originated and which they resemble in structure.

EF, HI, and KL represent an indefinite number of archi-, meso- and neoheterotrophic lineages respectively surviving to the present time.

It should be noted that the 'decreasing plasticity principle' is especially useful in explaining the origin of the intermediate phyla between the typical plants and animals. It might help to correct the untenable views that appear in even the most recent classifications of organisms that would show evolution of living (surviving) phyla from other living ones, particularly the *Schizomycota*. The living *Schizomycota*, although they are extremely small and may appear superficially simple in structure and in functioning, are really nothing of the kind. They are very complex due to millions of years of evolution and apparently have not given rise to other existing phyla of organisms. The *Schizomycota* and other phyla may have evolved in the very distant past from certain common ancestral lineages (see Fig. 2) but this is an entirely different matter. These relationships should be reflected in phylogenetic diagrams that are offered.

Some critics may wish to raise the possibility of a lineage remaining relatively unchanged (primitive) until the present day. There is hardly any such possibility since evolution by natural selection has been going on under the changing climatic conditions since life first originated. They may be primitive in some characters but that again is a different matter. Thus it should be emphasized that groups that do seem to be relatively primitive superficially, such as the *Schizomycota*, have evolved during the ages and are rather complex on their particular level as will be indicated later on.

INDEPENDENT AND DEPENDENT FEEDERS

The inspection of existing classifications (Tables 14, 15, 16) shows that the main divisions are based on the habits of nutrition, *but not consistently*. Whittaker (1959) recognizes photoautotrophs (independent feeders), and absorbers and ingestors (dependent feeders). However, there is basically only one type of dependent feeding (absorption of elaborated food). Ingestors are also absorbers that ingest the materials from which absorption takes place in a digestive pouch or tube. The division of organisms according to feeding habits is usually followed for algae and higher plants (independent feeders) and animals (dependent feeders), but such division somehow breaks down when the intermediate phyla, including photo- and chemoautotrophs and heterotrophs, are classified as has already been indicated. Such a scheme is outlined in Table 17.

Table 17. Showing inconsistency in applying the criteria for habits of feeding in current classifications.

Kingdom 1. Plantae
- (a) Algae and higher green plants (independent feeders)
- (b) Intermediate phyla, including **Schizomycota** (independent and dependent feeders), and **Myxomycota** and **Eumycota** (dependent feeders)

Kingdom 2. Animalia (dependent feeders)

The *Schizomycota* as now constituted are of ancient and very obscure origins, and are a heterogeneous assemblage containing chemoautotrophs, photoautotrophs and heterotrophs and this is hardly an acceptable phylogenetic grouping. Copeland

(1958) is to be credited with keen insight when he removed the photoautotrophic bacteria, containing bacterial chlorophyll, from the *Schizomycota* and placed them in the *Cyanophyta* (blue-green algae), containing plants with α-cholorophyll and other pigments. He stated that the criterion of size was not cogent because there are organisms of similar size already in the latter group. This was a step in the right direction, but such a taxon, containing organisms with bacterial cholorophyll and the other characters associated with it, is sufficiently distinct from a taxon, containing organisms with α-chlorophyll and other characters associated with it, and should not be placed in the same group. Thus in the present paper, the bacteria containing bacterial chlorophyll are given coordinate rank with the plants containing α-chlorophyll as the chief photosynthetic pigment.

Yet another kind of autotrophic organisms lies buried in the *Schizomycota* as now constituted. These are the chemoautotrophs—no one has considered them objectively from the standpoint of according appropriate rank to these organisms. Under the discussion of the origin of life, it was indicated that it is not known at present whether these originated independently of the photoautotrophs or evolved from the latter. For our purposes the question of their origin does not matter because we are confronted with organisms that have solved the problem of independent feeding in different ways from that of the photoautotrophs, and as such are entitled to cooordinate rank with the latter in any classification. They have achieved different habits of fixing carbon based on chemical energy sources as contrasted with light energy in the photoautotrophs. The problem posed here may be solved by applying the criterion of habits of nutrition consistently, as shown in Table 18.

Table 18. Consistent outline classification of organisms on the basis of independent and dependent feeding.

Superkingdom I **Autotrophae** (independent feeders*)
- Kingdom I. **Plantae** (autotrophic plants*)
  - Subkingdom I. **Chemoautotrophae** (phyla using chemical energy sources in fixing carbon)
  - Subkingdom II. **Photoautotrophae** (phyla using light energy in fixing carbon):
    - Infrakingdom I. **Thallophytae** (non-embryo-bearing plants)
      - Province I. **Bactochlorophylliae** (containing bacterial chlorophyll)
      - Province II. **Alphachlorophylliae** (containing a-chlorophyll: algae)
    - Infrakingdom II. **Embryophytae** (embryo-bearing plants; containing a-chlorophyll: **Bryophyta** and **Tracheophyta**)

Superkingdom II. **Heterotrophae** (dependent feeders)
- Kingdom II. **Heteroplantae** (other feeding plants; mesoheterotrophs; see Fig. 1; **Schizomycota, Myxomycota** and **Eumycota**)
- Kingdom III. **Animalia** (archiheterotrophs; see Fig. 1)

* Including also neoheterotrophs. See text discussion and Fig. 1.

It should be noted that although on a theoretical basis this is a three-kingdom system, in actual practice it is really a two-kingdom system.—*Plantae* (typical autotrophs and neoheterotrophs and *Heteroplantae* (mesoheterotrophs) are in the province of the botanist; and *Animalia* (archiheterotrophs) in the province of the zoologist. The objective is to resolve the problem posed by the mixture of organisms included in the old *Schizomycota*. The new phylum *Schizomycota* includes only mesoheterotrophs. The system outlined in Table 18 will be elaborated in the remainder of the paper. It is clear by this time that life should be considered as a whole, and the higher taxa such as "superkingdoms" and "kingdoms" should be interpreted as representing *parts of a whole*. In the past these have too often been regarded as representing separate disciplines.

KINGDOM I. PLANTAE

As already indicated, the organisms assigned here are obligate and facultative autotrophs, and neoheterotrophs, which are phylogenetically related to the former and are therefore classed with the former from which they originated. The organisms are subdivided on the basis of habits of nutrition—chemoautotrophs and photoautotrophs—and the other characters correlated with these according to the Adansonian principle (Adanson, 1763-64).

SUBKINGDOM I. CHEMOAUTOTROPHAE

Even after the lapse of more than eighty years since Winogradsky (1887, 1880, 1890, 1891) pioneered in the field of the chemoautotrophic organisms, the subject has not been intensively explored, and the true autotrophic nature of some of those reported is still in doubt. Although the autotrophic nature of others has been definitely established, much research is needed to adequately cultivate the entire field. It is hoped that the recognition of the *Chemoautotrophae* as coordinate with the *Photoautotrophae* will call attention to the need for research, and that doctorate theses and other research projects will be undertaken oftener from now on in the field of these fascinating microscopic organisms.

The chemoautotrophic habits of nutrition are unique among microscopic organisms. These habits are limited to a relatively few species, but the number of individuals involved may sometimes be enormous. According to Alexander (1961) the number of ammonia oxidizers (Class *Nitrosopsida,* see Table 21) may vary from zero to one million per gram of soil, but the larger counts are found only for soils of pH greater than 6.0. Those working with the higher plants may overlook such enormous population statistics. The chemoautotrophic bacteria are functional in helping to maintain the balance of nature, and have great economic importance, particularly with reference to cultivated plants. It is true that utility has no weight whatever in assigning rank to these organisms in any system of classification and reliance has to be placed on their unique position in having the ability of obtaining energy from the transformation of inorganic materials, and to utilize CO_2 for their entire carbon requirements. On that basis they are entitled to a coordinate rank with the photoautotrophs that obtain their energy from light and also utilize CO_2 for their entire carbon needs.

Those species capable of oxidizing only inorganic materials for their energy needs are known as 'obligate' or strict chemoautotrophs. In contrast, some species have evolved in the direction of heterotrophy and may obtain their energy from the oxidation of either inorganic materials or organic carbon, and these are known as 'facultative' chemoautotrophs. These organisms are intermediate between the obligate chemoautotrophs and those that have evolved to a completely heterotrophic habit of nutrition. The complete heterotrophs in this case are 'neoheterotrophs' as explained in Fig. 1, and the text discussion above. They are similiar in structure to the chemoautotrophs but differ in habit of nutrition, and are placed with autotrophs from which they evolved late in the history of life. This principle is of assistance in coping with the vexing problem of classifying certain types of bacteria. In practice such neoheterotrophs should be placed with the related chemoautotrophs as indicated because they belong there on the phylogenetic basis.

The autotrophic nature of the important nitrogen bacteria—*Nitrosomonas* and *Nitrobacter*—is definitely known. This is also true of some species of *Thiobacillus* and *Ferrobacillus.* Others are known to have facultative autotrophic nutrition. The classification of the five phyla adopted here (Table 21) is based on those species whose autotrophic nature is definitely established and any neoheterotrophic species (Fig. 1) related to them. The existence of selenium (Brenner, 1916, Lipman & Waksman, 1923) and manganese (Satory & Meyer, 1947; Prave, 1957) autotrophy is in doubt, and these reports remain to be verified. It is considered best to leave in the *Schizomycota* any that are in doubt. Should any others be found to be definitely autotrophic by later research, or should new autotrophic species be discovered, then it is time enough to transfer them to the subkingdom *Chemoautotrophae.*

As here interpreted, the subkingdom *Chemoautotrophae* is polyphyletic as shown in Fig. 2. Theoretically each group having a different habit of nutrition is coordinate with other similar groups, and on that basis each should be recognized as belonging to a separate kingdom, coordinate with the *Photoautotrophae.* As already indicated relatively few organisms have as yet been discovered that exhibit chemoautotrophy, and it would be inconvenient to recognize any large number of kingdoms. The logical compromise is to group all of the photoautotrophs in one subkingdom and all chemoautotrophs in another, with subdivisions under these for further distinctions (see Table 21). The student should note that such compromises often have

to be made in systematic work, always recognizing the apparently true, or lack of, phylogenetic relationships between the groups concerned, as a footnote.

There is need for a comprehensive summary of the knowledge of the *Chemoautotrophae.*

SUBKINGDOM II. PHOTOAUTOTROPHAE

The organisms in this subkingdom have the common bond of photoautotrophic nutrition, ranging from the anaerobic photosynthetic bacteria to the aerobic nutrition of the higher green plants. With the exception of two phyla containing bacterial chlorophyll, all of the rest contain α-chlorophyll as the chief photosynthetic pigment. As explained under Fig. 1, any neoheterotrophs related to the photoautotrophs are placed here also.

Kamen & Newton (1959)* have recently summarized the information concerning the photosynthetic particles found in these organisms, and this is reproduced here for the student.—

"These particles range in size from those encountered in bacteria and some blue-green algae—so-called 'chromatophores' in bacteria and 'grana' in the algae—to relatively enormous chloroplasts in some green plants. Chromatophores are spherical or semispherical bodies which can be as small as 30—40 millimicrons in diameter, while chloroplasts are variegated and often up to two orders of magnitude greater in linear dimensions. Grana are usually disc-shaped and intermediate in size between chromatophores and chloroplasts. They can occur as components or as individual entities.

"Considerable work has been done on the structure of chloroplasts and grana. Chloroplasts in higher plants are generally ellipsoid, typical dimensions in unicellular algae being 4—6 microns in diameter and 0.5—1 micron thick. They can exhibit a variety of forms. Usually a laminer pattern is seen in grana, indicating a structure consisting of 20—30 thin disc-shaped plates in a stack. These platelets are probably protein discs about 10 millimicrons thick which can carry one or more complete layers of chlorophyll intermixed with other componets of the photo-active system such as carotinoids, pyridine nucleotides, heme proteins, etc. Generally, the grana are embedded in unpigmented lipoproteins—so-called 'stroma'—which are probably the locus for enzymes involved in secondary functions such as CO_2 assimilation, phosphate transfer, protein and lipid synthesis, etc.

"Nothing is known about the fine structure of bacterial chromatophores but it is reasonable to suppose they are similar to small grana such as those found in blue-green algae. In fact, if we neglect the specification of a nucleus, a cell like the anerobic sulfur bacterium *Chromatium* can be considered as analogous to a chloroplast, the chromatophores filling the role of grana and the extrachromatophore material that of the stroma. Recently, electron microscope pictures of *Chromatium* have been published which suggest strongly that this analogy is not far-fetched (Vatter and Wolfe, 1958).

"These considerations lead to the expectation that a varied pattern of enzymatic composition should be found in all of these subcellular photo-active particles, depending on their degree of fragmentation. 'Whole' chloroplasts such as those isolated from *Spirogyra* (Thomas & Haans, 1955) or spinach (Arnon, et al, 1954) appear to contain a great number of enzymes, sufficient in fact to enable the chloroplast to function as a complete photosynthetic unit (Allen, et al, 1955). Fragmented chloroplasts, grana and chromatophores show fewer enzymatic activities, a number of soluble enzymes being recovered in the supernatant fluid from broken particles (Frenkel, 1956; Geller, 1959; Allen, et al, 1957; Newton & Kamen, 1957). However, all of these particles, fragmented or not, exhibit a general reaction initiated by light absorption and presumably intimately connected with the photochemical act. This reaction is the light-activated esterification of adenosine diphosphate (ADP) by inorganic phosphate (P_i) to form adenosine triphosphate

*The passages in quotation marks on this and the following page are excerpted from—

Martin D. Kamen and Jack W. Newton, "Particles in Photosynthetic Phosphorylation" in "Subcellular Particles," edited by Teru Hayashi. The Ronald Press Company, 1959.

(ATP); e. g. ADP + P_i + light—)ATP. The characteristics of this reaction, called 'photophosphorylation', are quite similar in all the different particles encountered, regardless of structural complexity, and can be described adequately by considering any one of the many systems which have been studied . . . The similarities which exist between the bacterial chromatophores and the green plant chloroplasts are such as to indicate that the same general mechanism is operative in photometabolism in both types of systems. It appears that the only essential difference between green plant and bacterial photosynthesis—namely, the lack of an oxygen evolution system in the latter case—is also the only essential difference found between bacterial chromatophores and green plant chloroplasts. It is likely that both systems function identically, or very similarly, in effecting photophosphorylation. . . . The electron transport chain coupled to the chloroplast system may span this whole range so that photophosphorylation efficiency is maximal for each electron transferred. On the other hand, the bacterial photo-oxidant may be generated at a considerably lower electro-chemical potential, particularly in the strict anerobes, so that a much smaller potential span is available in bacterial photosynthesis. Hence, the photophosphorylation efficiency in the bacteria may be significantly less. This may be correlated with the fact that although green plants dissipate most of their photo-oxidant as molecular oxygen, they still make enough ATP by photophosphorylation to satisfy all requirements for carbon dioxide assimilation. On the other hand, the bacteria with a less efficient system may require all their photo-oxidant to be reduced through the electron transport system."

The subkingdom *Photoautotrophae* as interpreted here on the basis of the analysis of photosynthetic nutrition (Kamen & Newton, 1959; Arnon et al, 1961) is apparently phylogenetic with two offshoots from a common ancestral lineage that may have had a more primitive type of photosynthesis (see Fig. 2) which has been superceded. One two-branched offshoot contains plants with the less efficient type of photosynthesis based on bacterial chlorophyll, and the other multi-branched offshoot contains plants with the more efficient type of photosynthesis based, chiefly on α-chlorophyll. On this basis the photoautotrophae should be grouped as indicated in Table 19.

Table 19. Classification of the Photoautotrophae on the basis of type of photosynthesis.

Infrakingdom 1. "Bactochlorophyllae"
Infrakingdom 2. "Alphachlorophyllae"
  Province 1. "Thallophytiae"
  Province 2. "Embryophytiae"

But such a division would omit the "Bactochlorophyllae" from the thallophytes. The latter is a useful taxon, and apparently a compromise has to be made to preserve this concept although it runs counter to a strict phylogenetic system. In the future the divisions shown in Table 19 may be adopted, but for the present the customary grouping will be used as shown in Table 20.

Table 20. Compromise classification of the Photoautrophae on the basis of structure (thallophytes and embryophytes). See also Tables 18 and 21.

Infrakingdom 1. **Thallophytae**
  Province 1. **Bactochlorophylliae**
  Province 2. **Alphachlorophylliae**
Infrakingdom 2. **Embryophytae** (also contain a-chlorophyll)

This disposition cuts across the line of the plants containing α-chlorophyll, but it emphasizes the importance of the evolution from the non-embryophytes to the embryophytes. The student should note the above as another compromise.

As shown in Tables 20 and 21, there are two comprehensive groups under *Thallophytae*. Province 1. *Bactochlorophylliae* to accomodate organisms containing bacterial chlorophyll, which is new, and Province 2, *Alphachlorophylliae*, to accomodate the algal phyla.

Under *Bactochlorophylliae*, Phylum 6. *Chromobiophyta* accomodiates th purple and brown photoautotrophic bacteria, and Phylum 7. *Chlorobiophy* cludes the green photoautotrophic bacteria. As indicated earlier, Copeland had transferred the organisms now included in the two phyla from the *Schizom* to the *Cyanophyta*. However, it is clear from the description of the photosyn particles (Kamen & Newton; Arnon, et al. 1961) that the photoautotrophic ba deserve a coordinate rank with the photoautrophic organisms containing α-ch phyll. The new Province *Bactochlorophylliae* is therefore fully justified.

The Province *Alphachlorophylliae* is divided into two major taxa, superph *Chromophytae*, to accomodate the five phyla of variously colored algae as di guished from the grass-green algae, and superphylum *Chlorophytae*, to include two phyla of grass-green algae. These seven phyla are recognized essentially delimited by G. M. Smith (1955). The Cryptomonads (*Cryptomonas, Chilomo* and Chloromonads (*Coelomonas*) are considered as algal groups of uncer taxonomic position.

In Infrakingdom 2. *Embryophytae*, only two phyla are recognized—Phy 15. *Bryophyta*, including non-vascular embryophytes, and Phylum 16. *Trac* phyta, the vascular embryophytes. Although this summary is on the whole confi to the phylal level, additional sub-taxa are included for the information of student, and to supplement the discussion.

Some authorities (Bold, 1957, and others) divide *Bryophyta* into more th one phylum, and they may be correct, but for the present the traditional phylum is recognized here.

There is considerable controversy about the status of the phylum *Tracheophy* One group, including Tippo (1942), and others, including also the writer, mainta that only one phylum is required for all of the plants having a vascular structu This phylum is analogous to the phylum *Chordata* under *Animalia* (see Table 21 A second group ,including Bold (1957), Cronquist (1960), and others, maintains tha there should be a number of phyla to accomodate the various evolutionary lineage Fundamentally these two schools of thought are not far apart—the difference be tween them concerns *relative* rank of taxa. As indicated earlier in this paper, th meaning of the relative ranks in the hierarchy of higher categories should be con sidered very carefully. It is not necessary to elevate the various lineages unde *Embryophytae* to phylal rank when the same purpose can be fulfilled by using the subphylum rank as shown in the scheme proposed by Tippo (1942). In the present system (see Table 21), under Phylum *Tracheophyta*, two subphyla are recognized, one—Pteroidophytina—to include the fern-like plants and the ferns, and the other— Spermophytina—to include the seed plants. Under these the various lineages are grouped into infraphyla, superclasses and/or classes as shown in Table 21. This pre- serves the 'pteridophyte' and 'spermatophyte' concepts as subphyla, and other con- cepts, including 'gymnosperm' and 'angiosperm', either as infraphyla or superclasses. All of these are useful in presenting the subject. If a long list of phyla, or even subphyla are employed, then no such distinctions are apparent.

KINGDOM 2. HETEROPLANTAE (PLANT-LIKE ORGANISMS)

The plant-like organisms (see Fig. 1 and text discussions above) under the Kingdom *Heteroplantae* were formerly usually placed under *Thallophyta*, and in- cluded heterotrophic as well as chemo- and photoautotrophic organisms. The latter two have been removed to the Kingdom *Plantae* as indicated in the previous discussion. Thus we are dealing only with mesoheterotrophs (see Fig. 2 and Table 21). All are predominantly plant-like, although the slime molds do have an animal-like plasmodium phase when they move and ingest food during part of the year, but later this movement ceases and spore sacs and spores are produced much like those of the higher fungi. This latter habit definitely places them with plant- like organisms. The plant-like organisms have been variously classified in the past, but this phase will not be discussed in detail here, but some recent suggestions for the solution of the problem are noted.

D. P. Rogers (1948) suggested on the basis of evolutionary tendencies in plants, fungi and animals that each of these should be recognized as a kingdom.

Under fungi he includes *Myxo- Phyco- Asco-* and *Basidiomycetes,* but he does not discuss the *Myxomycetes,* and leaves out the *Plasmodiomycetes* and *Acrasimycetes* which are included here also in the *Myxomycota* (see Table 21). He says nothing about the Schizomycota which also are included in the *Heteroplantae* in the present classification.

G. M. Smith (1955), who does not include the *Schizomycota* under *Thallophyta,* or even in the plant kingdom, is of the opinion that none of the fungi evolved from the algae, and states that "if, as appears to be the case, the divisions of a fungal nature have evolved from the protozoa, they have no phylogenetic connection with the divisions in the plant kingdom." He believes that they evolved independently of one another.

Cronquist (1960) is of the opinion that bacteria are apparently the most primitive groups of living organisms from which all other kinds of organisms evolved, and that the origin of the bacteria is obscure. According to his view, the bacteria branched in two directions. One branch gave rise to the blue-green algae *(Cyanophyta)* which in turn gave rise to the *Rhodophyta.* Lineages from the other branch evolved into all other plants. Among these other plants, the fungi (the *Phycomycetes-Ascomycetes-Basidiomycetes,* and *Myxomycetes* lines) originated as algal offshoots. He believes that new evidence on the phylogeny of the fungi "lies in the structure of the flagella" in *Myxomycetes* and *Phycomycetes.* The student should note that there is no essential difference between the specialized parts of the cell known as cilia and flagella—when they are less numerous they are called flagella.

In contrast to these views, the Kingdom *Herteroplantae,* or dependent-feeding plant-like organisms, as here interpreted, includes very ancient exclusively *mesoheterotrophic* lineages which originated from autotrophic lineages at an intermediate period in the history of life as previously explained (see Fig. 1, and the text discussion above). According to this view, such ancient lineages cannot be definitely connected with any existing algal phyla on the basis of the available evidence. It is more likely that both the photoautotrophic algae, and the phyla of the *Heteroplantae,* are separate offshoots from ancient autotrophic lineages, and thus are not strictly related phylogenetically among themselves, or with the phyla of algae as shown in Fig. 2. However, there is the possibility that they might retain some similar anatomical characters such as certain types of flagella in some algae on the one hand, and *Myxomycetes* and *Phycomycetes* on the other, as indicated by Cronquist (1960) and others. However, flagella and flagella-like relicts are of such widespread occurrence in organisms (Porter, 1957, Satir, 1961, Ehret, 1960) that even the sensory elements of the vertebrate eye have evolved from flagella. Thus this kind of evidence has to be discounted. The widespread occurrence of flagella and flagella-like relicts in *Plantae, Heteroplantae* and *Animalia* apparently is evidence that all living organisms have evolved from a common ancestral stock.

With further reference to any relationship between the phyla of the *Heteroplantae* to each other, it should be realized that they do not constitute a phylogenetic taxon on the kingdom level as already intimated. Thus there are two courses open to the worker—either each may be given coordinate rank as a kingdom, with an undue increase in the number of such taxa; or all three groups may be grouped together as one kingdom for convenience in classification. This latter course is justified so long as the apparently true status of each is realized, and this solution is adopted here.

Three phyla of *Heteroplantae—Schizomycota, Myxomycota* and *Eumycota*—are recognized (see Fig. 2 and Table 21). As previously explained, all of the autotrophs have been removed from the *Schizomycota,* and the Kingdom is composed exclusively of mesoheterotrophs.

Phylum 17. *Schizomycota,* mesoheterotrophic bacteria, includes six classes—*Eubacterimycetes, Actinomycetes, Chlamydobacteriomycetes, Myxobacterimycetes, Spirochaemycetes* and *Rickettsimycetes.*

Phylum 18. *Myxomycota,* the slime molds, includes three classes—*Myxomycetes, Plasmodiomycetes* and *Acsasimycetes.*

Phylum 19. *Eumycota,* the true fungi ,includes three classes—Phycomycetes (algal fungi), *Ascomycetes* (cup fungi), *Basidiomycetes* (club fungi).

The so-called "Deuteromycetes" (fungi imperfecti) do not constitute a phylogenetic taxon, but are in fact an artificial collection of imperfectly known fungi. As sufficient information becomes available about any of these, then each is referred to the appropriate class under the phyla listed above.

The lichens, included in some classifications, represent a symbiotic relationship between an alga and a fungus in each case, and are out of place here. They belong in the field of the ecologist.

KINGDOM III. ANIMALIA

As interpreted here the Kingdom *Animalia* includes archiheterotrophic lineages that had their origin early in the history of life before the autotrophic ancestral stock from which they originated had diversified to any extent toward the typical plants (see Figs. 1 & 2, Table 21, and the text discussions above). The classification here adopted is based in part on Hyman (1940-59), and Simpson, et al, (1957).

Two subkingdom are recognized—*Protozoae* and *Metazoae*. Subkingdom 1. *Protozoae* includes unicellular organisms that are definitely animal-like—archiheterotrophic ingestors. All plant-like organisms are excluded. The *Protozoae* are sometimes represented as being primitive, but this is hardly the case because the evolutionary process has been active over millions of years. They are, as in the case of the *Schizomycota*, ancient lineages, and although they may appear to be realtively primitive in structure, they are at any rate complex on a functional basis. The *Protozoae* are divided into two infraphyla: Infraphylum 1. *Plasmodromae*, in which the locomotor organelles are either pseudopodia or flagella, accomodates three phyla -20. *Zoomastigophora**, including animal-like flagellates; 21. *Sarcodina*, the rhizopods; and 22. *Sporozoa,—Plasmodium*, etc. Infraphylum 2. *Ciliophorae*, in which the locomotor organelles are cilia, accomodates Phylum 23. *Ciliophora,—Paramecium, Stentor*, etc. As shown in Fig. 2. these lineages apparently branched out from a common ancestral stock early in the history of life.

Subkingdom 2. *Metazoae* includes multicellular animals. There are two distinct evolutionary lines—Infrakingdom 1. *Parazoae*, with incipient tissue formation, represents a lineage distinct from that of Infrakingdom 2. *Eumetazoae*, with tissues and organ-system construction. Under *Parazoae*, Phylum 24. *Porifera* (sponges) is recognized, with interior cells of several kinds, without organs, digestive tract or mouth.

Infrakingdom 2. *Eumetazoae* is divided into two groups—Superprovince 1. *Radiatiae*, with primary radial symmetry, digestive cavity the sole body space, and with no anus; and Superprovince 2. *Bilateriae*, with bilateral symmetry or secondary radial symmetry; mostly also with body spaces in addition to the digestive cavity, and with anus usually present.

Under Superprovince. 1. *Radiatiae*, two phyla are recognized, Phylum 25. *Coelenterata*, the coelenterates, and Phylum 26. *Ctenophora*, the comb jellies. Under the latter is included the extinct animal lineage sometimes recognized as Phylum *Graptolithina*. This extinct lineage has sometimes been grouped with the Phylum *Chordata* on the basis of unreliable evidence.

Superprovince 2. *Bilateriae* is divided into three provinces on the basis of evolutionary trends.

In Province 1. *Acoelomatiae*, the region between the digestive tract and the body wall is filled with mesenchyme, the excretory system is composed of protonephridia which are provided with flame bulbs; the organisms are unsegmented or if segmented, the youngest segments are nearest the head; the anus may be absent or present. Three phyla are recognized—Phylum 27. *Platyhelminthes*, the flatworms. Phylum 28. *Mezozoa*, (Rhopalura), a group characterized by parasitic degeneration, which is given the rank of a subfamily by Hyman (1940). As here interpreted

* The unicellular organisms included under **Zoomastigophora** are restricted to the four distinctly animal-like orders **Protomondina, Polymastigina, Hypermastigina**, and **Rhizomastigina.** The other six orders of plant-like organisms containing a-chlorophyll, and related neoheterotrophs which Hyman (1940) included under **Protozoae** are referred to the Province **Alphachlorophylliae** (the algae), under Subkingdom 2. **Photoautotrophae** (Table 21).

they are organisms of the general type of the flatworms with a degenerated structure as a result of the parasitic mode of life. The third group. Phylum 29. *Nemertinea,* includes the nemertine or ribbon worms.

In Province 2. *Pseudocoelmatiae,* there is a space present between the digestive tract and the body wall, but this space is a pseudocoel and not a coelom; protonephridia and flame bulbs may or may not be present; the anus is present. Five phyla are recognized—Phylum 30. *Nematoda,* the round worms; Phylum 31. *Nematomorpha,* the horsehair worms; Phylum 32. *Acanthocephala,* the spiny-headed worms; Phylum 33. *Kinorhyncha,—Enchinoderes,* and Phylum 34. *Trochelminthes,—Rotifera* (wheel animalcules), and *Gastrotricha.*

In Province 3. *Eucoelmatiae,* there is a true coelom, and usually there is a well-developed entomesoderm; excretory organs are protonephridia with solenocytes, or metanephridia with or without nephrostomes; the anus is present. There are two subprovinces.

Under Subprovince 1. *Schizocoeliae,* there are two subgroups: (a) Infraprovince 1. *Lopophoriae,* with a circular or crescentric or double spirally coiled ridge, the lopophore, bearing ciliated tentacles; the intestines are looped, bringing mouth near the anus; the coelom is various. There are three phyla—Phylum 35. *Bryozoa,* the moss animals; Phylum 36. *Brachiopoda,* the brachiopoda or lamp shells; and Phylum 37. *Phoronidea, Phoronis.* (b) Infraprovince 2. *Anneloidiae,* without a lopophore, with a schizocoel; unsegmented or segmented. Three phyla are recognized—Phylum 38. *Mollusca,* mollusks: chitons:; snails, etc; scaphopods; clams, mussels; cephalopods, squids, octopuses; Phylum 39. *Annelida,* segmented worms; and Phylum 40. *Arthropoda,* the arthrodpods, crustaceans, arachnids, centipedes, millipedes, insects, etc.

The members of Subprovince 2. *Entercoeliae,* are without a lopophore; and the coelom is an entercoel. Three phyla are recognized—Phylum 41. *Chaetognatha,* the arrow worms; Phylum 42. *Echinodermata,* the echinoderms; and Phylum 43. *Chordata,* tongue worms, tunicates; ascidians; lancelets; and vertebrates—fishes, amphibians, reptiles, birds, mammals.

A WORD TO THE STUDENT

This brief summary is all too short to cover adequately the large subject for the ordering of diversity among living organisms. It should be considered as an outline for further study on the basis of the selected bibliography, and the examples of organisms cited for each of the 43 phyla.

It is hoped that the student will carry away with him a dynamic historical view that reveals what really matters are basic advances—the rigorous procedure for description of the organism, the multivariate principle in classification, the mechanism of evolution, particulate inheritance, etc.—and not static systems of classification, no matter how practical these may be for the hour.

Thus, it should be realized that the classification of organisms will never be completed because there is so much that is still unknown about them. One can expect that areas of disagreement may decrease and areas of agreement increase, with time as new facts become known, but there will still be unknown areas. Thus the student should not expect rigidity in any classification. A science that does not change is a dead science.

The student who may not have had the advantage of a thorough course in biology, including classification, should not give up hope. In many cases he may obtain materials for study locally. In cases where such materials are not available locally, he may in most instances obtain them from a biological supply house. This is particularly true of microscopic organisms such as the chemo- and photoautotrophic bacteria, and the heterotrophic bacteria. Although a knowledge of one or more examples of each of the 43 phyla cannot be equated with an adequate knowledge of biology, it can go a long way toward awakening an interest that may lead to further study of not only the structural but also the functional diversity. Today there are many opportunities for adult study in local high schools and colleges and the interested beginning or adult student should make a start as the opportunity is offered. He should remember also that most excellent texts are now available, such as that of Simpson et al (1957). Their kind was unknown in the writer's student

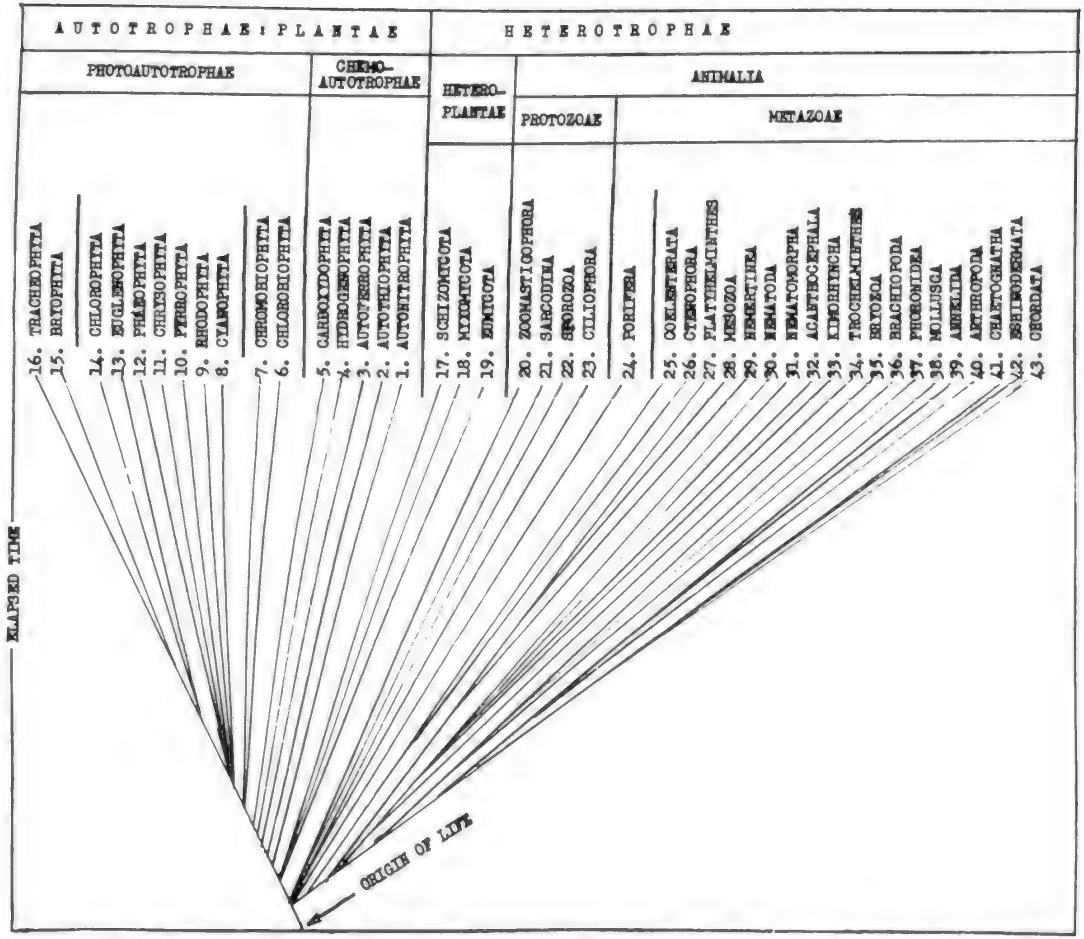

Fig. 2. A generalized diagram to illustrate a postulated phylogeny of the 43 phyla of living organisms with lineages plotted against elapsed time—**AUTOTROPHAE** (nos. 1—16, **PLANTAE**), and **HETEROTROPHAE** (nos. 17—19, **HETEROPLANTAE**; and nos. 20—43, **ANIMALIA**). See Fig. 1, text discussions, and Table 21.

days. The student in this atomic age is thus in a most enviable position and should make the most of his enlarged opportunities.

TABLE 21. THE PHYLA OF ORGANISMS

Superkingdom I. **AUTOTROPHAE** (Obligate or facultative chemo- and photoautotrophs that utilize either inorganic compounds or light as energy sources; and CO2, as the sole source of carbon; and related neoheterotrophs).

Kingdom I. **PLANTAE** (same as above)

Subkingdom 1. **CHEMOAUTOTROPHAE** (Obligate or facultative chemoautotrophs that utilize inorganic compounds as energy sources, and CO_2 as the sole source of carbon; and related neoheterotrophs)

Phylum 1. AUTONITROPHYTA (Obligate chemoautotrophs that utilize inorganic nitrogen compounds as energy sources, and CO_2 as the sole source of carbon; and related neoheterotrophs)

Class 1. Nitrosopsida (energy obtained from the oxidation of ammonia to nitrite)
Order 1. Nitrosomonales
Family 1. Nitrosomonaceae (**Nitrosomonas, Nitrosococcus, Nitrosospira, Nitrosocystis, Nitrosogloea**)
Class 2. Nitrobacteropsida (energy obtained from the oxidation of nitrite to nitrate)
Order 1. Nitrobacterales
Family 1. Nitrobacteraceae (**Nitrobacter, Nitrocystis**)

Phylum 2. AUTOTHIOPHYTA (obligate or facultative chemoautotrophs uitilizing elemental sulfur or inorganic sulfur compounds for energy; and related neoheterotrophs)

Class 1. Thiobacillopsida
Order 1. Thiobacillales
Family 1. Thiobacillaceae (**Thiobacillus**—9 species. Note.— **T. ferrooxidans** appears to be a link with the next phylum because it has the capacity to use energy from the oxidation of either ferrous or sulfur salts; the two phyla will apparently have to be reduced to subphyla under the Phylum **HALENERGEIOPHYTA** in the next revision).

Phylum 3. AUTOFERROPHYTA (obligate or facultative chemoautotrophs oxidizing ferrous iron to the ferric state for energy; and related neoheterotrophs. See note under Phylum 2, above)

Class 1. Ferrobacillopsida
Order 1. Ferrobacillales
Family 1. Ferrobacillaceae (**Ferrobacillus, Siderobacter, Siderococcus**)
Order 2. Gallionellales
Family 1. Gallionellaceae (**Gallionella, Siderophacus**)
Order 3. Leptothringales
Family 1. Leptothringsceae (**Leptothrix, Sphaerotilus, Toxothrix**)

Phylum 4. HYDROGENOPHYTA (facultative chemoautotrophs utilizing energy from oxidation of either H_2 or short chain fatty acids and simple alochols; and related neoheterotrophs)

Class 1. Hydrogenopsida (hydrogen bacteria)
Order 1. Hydrogenomonales
Family 1. Hydrogenomonaceae (**Hydrogenomonas**)
Class 2. Methanopsida (methane forming hydrogen bacteria)
Order 1. Methanobacteriales
Family 1. Methanobacteriaceae Barker, 1956 (**Methanobacterium, Methanobacillus, Methanosarcina, Methanococcus**)

Phylum 5. CARBOXYDOPHYTA (facultative chemoautotrophs using energy from the oxidation of carbon monoxide to carbon dioxide)

Class 1. Carboxydopsida
Order 1. Carboxydomonales
Family 1. Carboxydomonaceae **(Carboxydomonas)**

Subkingdom 2. **PHOTOAUTOTROPHAE** (obligate and facultative photoautotrophs that utilize light as the source of energy, and CO_2 as the sole source of carbon; and related neoheterotrophs)

Infrakingdom. 1. **THALLOPHYTAE** (non-embryo-bearing photoautotrophs and related neoheterotrophs)

Province 1. **BACTOCHLOROPHYLLIAE** (photoautotrophic bacteria—obligate or facultative photoautotrophs containing bacterial chlorophyll; and related neoheterotrophs)

Phylum 6. CHROMOBIOPHYTA (red, purple and brown Bactochlorophylliae)

Class 1. Chromatiopsida
Order 1. Chromatiales
Family 1. Chromatiaceae **(Chromatium)**
Class 2. Rhodobacteriopsida
Order 1. Rhodobacteriales
Family 1 Rhodobacteriaceae **(Rhodobacterium** Molisch)
Class 3. Rhodomicrobiopsida (photoheterotrophs containing teriochlorophyll, using acetone, etc. as source of Hydrogen)
Order 1. Rhodomicrobiales
Family 1. Rhodomicrobiaceae **(Rhodomicrobium)**

Phylum 7. CHLOROBIOPHYTA (obligate and facultative photoautotrophic green sulfur bacteria)

Class 1. Chlorobiopsida
Order 1. Chlorobiales
Family 1. Chlorobiaceae **(Chlorobium)**

Province 2. **ALPHACHLORAPHYLLIAE** (the algae—obligate or facultative photoautotrophs containing α-chlorophyll; and related neoheterotrophs). The Cryptomonads (**Cryptomonas, Chilomonas,**) and Chloromonads (**Coelomonas**) are considered as algal groups of uncertain taxonomic position.

Superphylum 1. **CHROMOPHYTAE** (containing other colored pigments in association with α-chlorophyll)

Phylum 8. CYANOPHYTA blue-green algae; **Cholorcoccus, Oscillatoria, Nostoc,** etc.

Phylum 9. RHODOPHYTA red algae: **Porphyra, Cumagloia, Nelamion,** etc.

Phylum 10. PYRROPHYTA (greenish-tan and golden-brown algae: **Oxyrrhis, Exuviaella,** etc.)

Phylum 11. PHAEOPHYTA (brown algae: **Macrocystis, Echocarpus, Cutleria,** etc.)

Phylum 12. CHRYSOPHYTA (yellowish-green algae: **Triboema, Vaucheria, Melosira,** etc.)

Superphylum 2. **CHLOROPHYTAE** (green-algae: euglenoids and grass-green algae)

Phylum 13. EUGLENOPHYTA (Euglenoids: **Euglena, Astasia, Colacium,** etc.)

Phylum 14. CHLOROPHYTA (grass-green algae: **Volvox, Spirogyra,** etc.)

Infrakingdom 2. **EMBRYOPHYTAE** (embryo-bearing plants with a α-chlorophyll as the chief photosynthetic pigment; and related neoherotrophs

Phylum 15. BRYOPHYTA (non-vascular embryophytes; general similarity in life cycle—all have a dominant sexual phase and a much smaller sporophyte phase that is either partially or wholly dependent on the former)

Class 1. Hepatiopsida (liverworts: **Spaerocarpus, Marchantia, Riccardia, Calobryum,** etc.)
Class 2. Anthoceropsida (hornworts: **Anthoceros, Notothylas,** etc.)
Class 3. Musciopsida (mosses: **Funaria, Sphagnum, Andreaea,** etc.)

Phylum 16. TRACHEOPHYTA (vascular embryophytes; all have a dominant sporophyte phase and a much smaller sexual phase)
Subphylum 1. **Pteroidophytina** (fern-like plants and ferns: both the gametophytes and the sporophyte are independent plants at maturity)
Infraphylum 1. **Psilophytinae** (**Psilotum**)
Infraphylum 2. **Lycopodophytinae** (lycopods and club-mosses: **Lycopodium, Selaginella,** etc.)
Infraphylum 3. **Arthrophytinae** (articulates: **Equisetum**)
Infraphylum 4. **Pterophytinae** (ferns)

Class 1. Archipteropsida (early ferns—sporangia borne on pedicels, forming panicles and clusters: **†Protopteridium, †Svalbardia,** etc.—all extinct)
Class 2. Eusporopsida (sporangium developed from a group of initial cells, jacket layer more than one cell in thickness: **Ophioglossum, Marattia,** etc.)
Class 3. Leptosporopsida (sporangium developed from a single initial cell, jacket layer one cell in thickness: **Osmunda, Schizaea,** etc.)

Subphylum 2. **Spermophytina** (seed plants: permanent retention of female gametophyte within tissues of sporophyte; production of seeds, and temporary cessation of growth at a certain stage in development of embryonic sporophyte)
Infraphylum 1. **Gymnospermophytinae** (naked-seeded plants)
Superclass 1. **Archispermopsidae** (early seed plants: growth fern-like; seeds form in various ways on fronds, sometimes partially enclosed in a cupule: **†Lyginopteris, †Crossotheca,** etc.—all extinct)
Suberclass 2. **Gnetopsidae** (**Gnetum, Ephedra, Welwitschia,**
Superclass 3. **Ginkgopsidae** (**Ginkgo**)
Superclass 4. **Coniferopsidae** (cordaites and conifers: **†Cordaites, Pinus, Podocarpus,** etc.)
Superclass 5. **Cycadopsidae** (cycads: **†Cycadeooidea, Cycas, Zamia,** etc.)
Infraphylum 2. **Anthophytinae** (flowering plants; seeds hidden in the fruit.)
Superclass 1. **Dicotyopsidae** (**Wintera, Magnolia, Ranunculus,** etc.)
Superclass 2. **Monocotyopsidae** (**Alisma, Commelina, Orchis, Triticum,** etc.

Superkingdom II. **HETEROTROPHAE** (mesoheterotrophs and archiheterotrophs—other feeding organisms: parasites and saprophytes, including plant-like organisms, and animals)
Kingdom II. **HETEROPLANTAE** (mesoheterotrophs—unicellular and multicellular plant-like parasites and saprophytes)
Phylum 17. SCHIZOMYCOTA (heterotrophic bacteria)

Class 1. Eubacterimycetes (**Pseudomonas, Acetobacter, Streptococcus, Lactobacillus,** etc.)
Class 2. Actinomycetes (**Mycobacterium, Actinomyces,** etc.
Class 3. Chlamydobacterimycetes (**Leptothrix, Crenothrix, Begginton,** etc.)
Class 4. Myxobacterimycetes (**Cryptophaga,** Chondromyces, Polyangium, **Myxococcus,** etc.)

Class 5. Spirochaemycetes (**Borrelia, Treponema, Spirochaeta,** etc.)
Class 6. Rickettsimycetes (**Rickettsia**)

Phylum 18. MYXOMYCOTA (Slime molds)

Class 1. Myxomycetes
Subclass 1. Eusporomycetidae
Order 1. Liceales
Family 1. Licaceae Rost. Versuch. 4. 1873 (**Licea**)
Family 2. Reticulariaceae Rost. Versuch. 6. 1873 (**Reticularia, Tubifera, Lycogala, Dictydiaethalium**)
Family 3. Cribriariaceae (**Cribriaria**)
Subclass 2. Exporomycetidae
Order 1. Ceratiomyxales
Family 1. Ceratiomyxaceae Schroeter, in EP. 1889. (**Ceratiomyxa** Schroeter—syn-**Ceratium** Albertini & Schwintz, 1805, non Schrank, 1793)
Class 2. Plasmodiomycetes
Order 1. Plasmodiophorales
Family 1. Plasmodiophoraceae (**Plasmodiophora**)
Class 3. Acrasimycetes
Order 1. Acrasiales
Family 1. Sappiniaceae (**Sappinia**)
Family 2. Guttulinaceae (**Guttulinopsis, Guttulina**)
Family 3. Acrasiaceae (**Acrasis, Dictyostelium, Coenonia, Polysphondylium**)

Phylum 19. EUMYCOTA (true fungi)

Class 1. Phycomycetes (algal fungi—**Olpidium, Allomyces, Pythium, Rhizopus,** etc.)
Class 2. Ascomycetes (cup fungi—**Pyronema, Eremascus, Peneeillium, Neurospora, Saccharomyces,** etc.)
Class 3. Basidiomycetes (Club fungi—**Agaricus, Corticium, Stereum, Psalliota, Phallus, Puccinia, Ustilago,** etc.)
"Deuteromycetes" (fungi imperfecti)—an artificial group—**Colletotchricum lindemuthianum** (bean anthracnose); **Alternaria solani** (early potato blight); species of **Epidermophyton,** and **Trichophyton** (athlete's foot), etc.)

Kingdom III. **ANIMALIA** (animals—archiheterotrophs, usually ingesting materials from which elaborated food is absorbed)
Subkingdom 1. **PROTOZOAE** (unicellular animals)
Infrakingdom 1. **PLASMODROMAE** (locomotor organelles either with pseudopodia or flagella; sexual reproduction by complete fusion of gametes)

Phylum 20. ZOOMASTIGOPHORA (animal flagellates)
Class 1. Protomonadina (**Oicomonas, Rhizomastix,** etc.; and the trypanosomes — **Leishmania, Trypanosoma,** etc.)
Class 2. Polymastigina (**Chilomastix, Tetramitus, Trichomonas,** etc.)
Class 3. Hypermastigina (**Lophomonas, Barbulonympha,** etc.)
Class 4. Rhizomastigina (**Magistamoeba, Mastigina, Mastigella,** etc.

Phylum 21. SARCODINA (the rhizopods—**Amoeba, Pelomyxa,** etc.)
Phylum 22. SPOROZOA (internal parasites—**Gregarina, Monocystis, Adelea, Plasmodium,** etc.)
Infrakingdom 2. **CILIOPHORAE** (animals having locomotor organelles in the form of cilia throughout or in young stages)
Phylum 23. CILIOPHORA (same as above)

Class 1. Ciliata (**Frontonia, Paramecium, Didinium,** etc.)
Class 2. Suctoria (**Podophyra, Acineta, Ephelota,** etc.)

Subkingdom 2. **METAZOAE** (multicellular animals; composed of cells which may lose their boundaries in the adult state)

Infrakingdom 1. **PARAZOAE** (Incipient tissue formation, interior cells of several kinds; without organs, digestive tract, or mouth)

Phylum 24. **PORIFERA** (sponges **Archecyathus, Scypha, Hyalonema,** etc.)

Infrakingdom 2. **EUMETAZOAE** (Tissues and organ-system construction, with mouth and digestive tract, except when lost by parasitic degeration; interior cells reproductive only in part)

Superprovince 1. **RADIATIAE** (with primary radial symmetry; digestive cavity the sole body space; anus absent)

Phylum 25. **COELENTERATA** (coelenterates—**Hydra, Clathrodictyon, Aurelia, Astrangia,** etc.)

Phylum 26. **CTENOPHORA** (comb jellies **Cestum,** etc.)

Superprovince 2. **BILATERIAE** (with bilateral symmetry or secondary radial symmetry; mostly also with body spaces in addition to the digestive cavity; anus usually present)

Province 1. **ACOELOMATIAE** (Region between digestive tract and body wall filled with mesenchyme, excretory system of protonephrida with flame bulbs; unsegmented, or if segmented, then youngest segments nearest the head; anus absent in phyla 27 and 28, present in phylum 29)

Phylum 27. **PLATYHELMINTHES** (flatworms—**Dugesia, Fasciola, Taenia,** etc.)

Phylum 28. **MESOZOA** (degerate parasites—**Dicyema, Pseudicyema, Rhopalura,** etc.)

Phylum 29. **NEMERTINEA** (nemertime or ribbon worms—**Lineus,** etc.)

Province 2. **PSEUDOCOELMATIAE** (space present between digestive tract and body wall but this space is a pseudocoel and not a coelom; with or without protonephridia, flame bulbs present or absent; anus present;)

Phylum 30. **NEMATODA** (roundworms — **Ascaris, Trichina,** etc.)

Phylum 31. **NEMATOMORPHA** (horsehair worms—**Paragordius,** etc.)

Phylum 32. **ACANTHOCEPHALA** (spinyheaded worms—**Gigantorhynchus,** etc.)

Phylum 33. **KINORHYNCHA** (Enchinoderes)

Phylum 34. **TROCHELMINTHES** (Rotifera—**Asplancha**; Gastrotricha—**Chaetonotus**)

Province 3. **EUCOELOMATIAE** with a true coelom, and usually well-developed entomesoderm; excretory organs are protonephridia with solenocytes, or metanephridia with or without nephrostomes; anus present)

Subprovince 1. **SCHIZOCOELIAE** (coelom a schizocoel)

Infraprovince 1. **LOPHOPHORIAE** (with a circular or crescentric or double spirally coiled ridge, the lophophore, bearing ciliated tentacles; intestines looped, bringing mouth near anus; coelom various)

Phylum 35. **BRYOZOA** (moss animals—Endoprocta: **Urnatella,** etc; Ecotprocta: **Plumatella, Bugula,** etc.)

Phylum 36. **BRACHIOPODA** (lampshells—Inarticulata: **Lingula,** etc.; Articulata: **Laqueus, Terebratulina,** etc.)

Phylum 37. **PHORONIDIA** (**Phoronis,** etc.)

Infraprovince 2. **ANNELOIDIAE** (without a lophophore; coelom a schizocoel; unsegmented or segmented)

Phylum 38. **MOLLUSCA** (mollusks—chitons: **Chiton**; snails etc.; **Helix, Buccinum, Arion, Patella, Archidoris, Tethys, Dentalium**; clams and mussels: **Venus, Anodonta, Phoas, Solen,** etc.; squids, octopuses and nautilus: **Loligo, Octopus, Nautilus**)

Phylum 39. ANNELIDA (segmented worms—**Neanthes, Nereis, Lumbricus, Polygordius, Hirndo, Sipunculus,** etc.)

Phylum 40. ARTHROPODA (arthropods—crustaceans, arachnids, centipedes, millepedes, insects)

Subprovince 2. **ENTERCOELIAE** (without a lopophore; coelom an entercoel)

Phylum 41. CHAETOGNATHA (arrow worms—**Sagitta,** etc.)

Phylum 42. ECHINODERMATA (echinoderms—starfishes, etc. —**Antedon, Asterias, Ophiura, Strongylocentrotus, Cucumaria,** etc.)

Phylum 43. CHORDATA (tongue worms—**Balanoglossus,** etc.; tunicates—**Ciona;** Lancelets—**Branchiostoma;** vertebrates—fishes: **Petromyzon, Squalus, Acipenser,** etc.; tetrapods—amphibians: frogs, **Rana,** etc.; reptiles: **Aromochelys, Gerrhonotus, Thamnophis, Crocodilus,** etc.; birds—**Columba,** etc.; mammals: marsupials—**Didelphis,** etc.; Placentals—**Cebus, Homo,** etc.)

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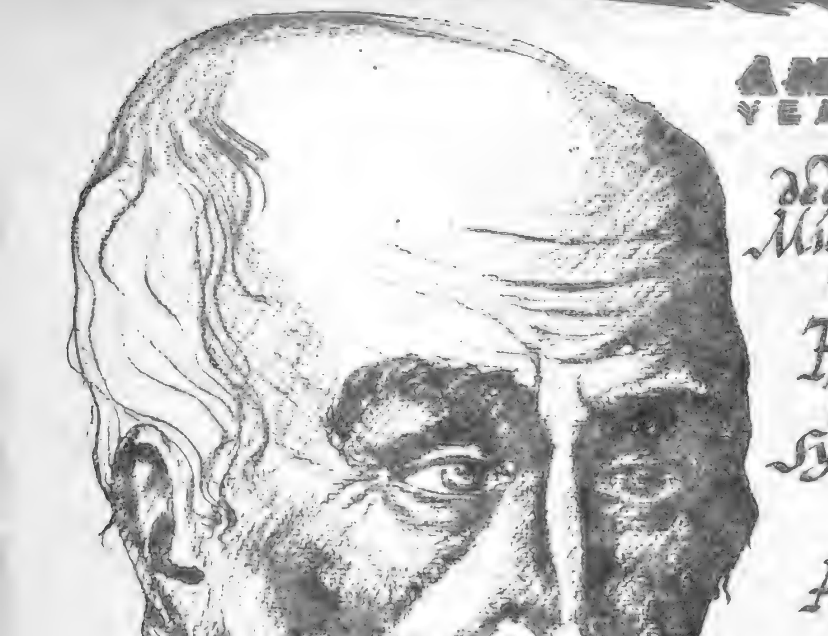

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The American Plant Life Society
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PLANT LIFE

VOLUME 19

[Nos. 1-4, Jan., Apr., Jul. & Oct.]

1963

EDITED BY

HAMILTON P. TRAUB

HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY

Box 150, La Jolla, California

Printed in the United States of America

Address correspondence and send membership dues to:
Dr. Thomas W. Whitaker, Executive Secretary,
The American Plant Life Society,
Box 150, La Jolla, California

TABLE OF CONTENTS

The cover features a portrait of Michel Adanson (1728—1806) by Penrith B. Goff as part of the celebration of the Adanson Bicentenary to commemorate the publication of "Familles des Plantes" in 1763—64.

PLANT LIFE, VOLUME 19, NO. 1, 1963—AMARYLLIS YEAR BOOK
GENERAL AMARYLLID EDITION

3. GENETICS AND BREEDING

4. CULTURE

PLANT LIFE, VOLUME 19, NOS. 2—4, INCL., 1963
GENERAL EDITION

ILLUSTRATIONS

CORRIGENDA

PLANT LIFE, VOL. 18. 1962

Page iii, 3rd line, in heading "PLANT LIFE, VOLUME 18, etc.", change "1961" to "1962".

Page iv, In heading, "PLANT LIFE VOLUME 18, etc.", change "1961" to "1962".

Page 9, 18th line from top is misplaced; it should be indicated as the first line of text under "South African Travels, 1960".

Page 13, 20th line from top, change "Sept. 28" to "Sept. 22".

Page 59, Under "V. MEXICANA ALLIANCE," 3rd line, change "It" to "The species".

Page 62, under 14a, 3rd line, change "long" to "wide".

Page 66, 18th and 19th lines from top, indicate that "nel-shaped, margins erect" is to follow 20th line, "Cup 2.2 cm. long, fun-".

Page 67, under 40a, 1st line. change "cm." to "mm.".
under 40b, 2nd line, change "cm" to "mm."

1962 SUPPLEMENT—THE PHYLA OF ORGANISMS

Page 7, Table 2, heading of table, change "Heterplantae" to "Heperoplantae".

Page 9, 17th line from bottom, change "was" to "is".

Page 14, 6th line from top, change "millenia" to "millennia".

Page 17, footnote, 4th line, change "movemest" to "movement".

Page 18, 19th line from top, change "object" to "objective".

Page 29, 1st line of text, change "1880" to "1888".

Page 32, 5th paragraph, 2nd line, change "maintain" to "maintains".
20th line, change "are" to "is".

Page 34, under "KINGDOM III. ANIMALIA":
6th line, change "subkingdom" to "subkingdoms".
13th line, change "infraphyla: Infraphylum" to "Infrafamilies: Infrafamily".
16th line, change "Infraphylum" to "Infrafamily".

Page 35, 17th line, between "bringing" and "mouth" insert "the".

Page 37, under Superkingdom I. Autotrophae, 3rd line, change "CO2" to "CO_2".
under Phylum 3. Autoferrophyta, order 3, Leptothringales, Family 1, change "Leptothringscese" to "Leptothringaceae".

Page 38, 3rd line from bottom, delete "a".

Page 39, 4th line from bottom, delete "Leptothrix".

Page 41, under Infrakingdom 2. "Eumetazoe" 3rd line, change "degeration" to "degeneration".
under Phylum 28, Mesozoa, change "degerate" to "degenerate".

Page 43, 28th line from top, change "Titis" to "Titus".

[**CORRIGENDA**, continued on page 160.]

PLANT LIFE, VOL. 19, NO. 1, January, 1963

AMARYLLIS
YEAR BOOK
1963

Year Book of
The American Amaryllis Society
30th issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 155.]

PREFACE

The year 1963 marks the 200th anniversary of the publication of Michel Adanson's "Familles des Plantes". This event is of major significance in the development of the science of biosystematics. It is also of interest to the members of the Society because the work commemorated contains the *first description* of the amaryllids as a natural group. This subject is elaborated in an article in the present issue; in it there is also brief mention of the ADANSON BICENTENARY celebration in 1963-64.

The outstanding ADANSON BICENTENARY cover design is the work of the Artist to the Society, Prof. Penrith Goff, of the University of Chicago. He is to be congratulated on an excellent job.

It is fitting that the 1963 issue of the AMARYLLIS YEAR BOOK is dedicated to Michel Adanson, the Father of the Amaryllis Family, and also to Mr. W. D. Morton, Jr., who received the WILLIAM HERBERT MEDAL award for 1963 for his outstanding contributions toward the advancement of the amaryllids, and also to La Forest Smith Morton (1887—1955). Mr. Morton carried forward the important work started by his wife on the registration of Amaryllis clones, the elevation of the standards for judging Amaryllis, and the encouragement of the organization of local Amaryllis societies—all in collaboration with the officers of the Garden Circles Amaryllis Club, the Dallas Amaryllis Society, the Shasta Garden Club of San Antonio, Texas, the Houston Amaryllis Society, the Hattiesburg Amaryllis Society, the Mobile Amaryllis Society, the Amaryllis Forum of Mobile, the Men's Amaryllis Club of New Orleans, the Coastal Bend Amaryllis Society, and the Valdosta (Ga.) Men's Garden Club. Mr. Morton and the officers of these local Amaryllis societies are to be congratulated for their untiring devotion to this work. It was not possible to award the HERBERT MEDAL to all of these workers, but in awarding it to Mr. Morton, his wife, the late La Forest Smith Morton, and all of the workers are also honored.

Mr. Morton contributes an interesting autobiography, and Mrs. Haydel has favored us with a brief biography of Mrs. Morton.

The present issue contains biographies of Mr. Buller, the South African amaryllisarian, and Mr. Alick Percy-Lancaster, who worked with his father on the descriptions of *Gloriosa*. Mr. Sydney Percy-Lancaster writes a charming report on his journey from Rhodesia to India.

The articles on *Amaryllis* in the present issue are outstanding as usual. First of all, the important reports on the symptoms of *Amaryllis* mosaic disease by Drs. Kahn & Smith, and by Mr. Quinn Buck, are to be noted. All of us have been waiting for reports of this kind because these promise to help in eradicating this disfiguring disease. Equally important are the reports on the effects of the 1962 freeze in the lower South, and the lessons to be learned therefrom, by Mrs. Pickard, and Messrs. Perrin, Latapie, Authement and Davis. These reports are valuable as a base for future programs on overwintering amaryllids in the lower South.

Mr. Goedert's annual report on the Amaryllis season just passed is a feature that all members look forward to. Two new *Amaryllis* species are described—*A. starkii* Nelson & Traub, and *A. chionedyanthe* Cardenas; Mr. Fesmire writes on a longer *Amaryllis* flowering season; Mr. Boshoff-Mostert on the culture and breeding of *Amaryllis* in South Africa; Mrs. Seale on the flowering of the Boshoff-Mostert *Amaryllis;* Mrs. Tebban on the moving of her *Amaryllis* from Illinois to Florida; Mr. Beckwith D. Smith on the growing of *Amaryllis* in north Georgia; Mrs. Abendroth on the Blue Amaryllis in Brasil; Mr. Sudd on the use of artificial light in *Amaryllis* culture; Mr. Cloutte on seedling records and the clone 'Mrs. Garfield'; and Mrs. Williams on red leaf spot control. Mrs. Flick contributes excerpts from the Amaryllis Round Robin letters.

As usual, the other amaryllids are not neglected—new species of *Hymenocallis* and *Zephranthes* are described; Mrs. Shirley and Mr. Clark report on native American Crinums; Mr. Hannibal writes on *Crinum flaccidum;* Mr. Hunt on *Lycoris* in North Carolina; Miss Grapes on *Lycoris* in Nebraska; Mr. McNeil on *Cryptostephanus;* Dr. Flory & Mrs. Schmidhauser on the chromosomes of the Blue Amaryllis; Messrs. Caldwell, and Jacoway, on Lycoris breeding; Mrs. Anderson on breeding Brunsvigias and Crinodonnas; Dr. Joseph C. Smith on *Hymenocallis velardei;* Dr. Zorbach on amaryllids in Maryland, and Mrs. Schumann on amaryllids in Michigan. There are other interesting items, including the reports on the 1962 Amaryllis shows.

Contributors to the 1964 issue of THE AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1963, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated.

December 15, 1962,
5804 Camino de la Costa,
La Jolla, California.

Hamilton P. Traub
Harold N. Moldenke

THE GENERA OF AMARYLLIDACEAE

"The Genera of Amaryllidaceae", by Hamilton P. Traub, 85 pages, 10 illustrations, $5.00 postpaid, is now ready. This represents a great amount of time and work. It includes a short history of the Amaryllis Family, a chromosome atlas of the amaryllids, and other introductory matter; a key to, and descriptions of, the 97 genera and 5 bi-generic hybrids, of the Amaryllidaceae; and an index to the genera. This handy reference booklet should be within reach of all who are interested in the Amaryllids. Send orders to: Dr. Thomas W. Whitaker, Executive-Secretary, American Plant Life Society, Box 150, La Jolla, Calif.

COMMEMORATING THE PUBLICATION OF
"FAMILLES DES PLANTES", 1763-64;
THIS BOOK IS DEDICATED TO
MICHEL ADANSON (1728-1806), FOUNDER OF
THEORETICAL SYSTEMATICS; FATHER OF
THE AMARYLLIS FAMILY;
AND TO
WILLIAM D. MORTON, JR., AND LA FOREST MORTON,
WHO RE-ESTABLISHED THE REGISTRATION OF
Amaryllis L., CULTIVAR NAMES
AFTER WORLD WAR II

Herbert Medalist—William Douglas Morton, Jr.

WILLIAM DOUGLAS MORTON, JR.

An autobiography

I was born on September 16, 1887, at Louisville, Kentucky, the son of William Douglas, and Rosalie Tandy, Morton, Sr. My father had acquired an interest in a lumber mill at Montague, Florida, and when I was four, we moved to Florida. My mother died when I was nine, and we moved to Ocala, Marion County, Florida, where I was educated in the public schools. My boyhood was lived in the beautiful country side of central Florida where the fascinating Silver Spring is located near Ocala. My education was later supplemented with a special course in mathematics at Morrison's School, Savannah, Georgia.

When my father sold his interest in the lumber mill in 1905, we moved to the lumber town of Cutting, Georgia, where he was general manager of a large lumber mill for the Minnesota Lumber Company. At this time, I took up the vocation of locomotive engineer, and also had the pleasure of first meeting Miss La Forest Smith of Homerville, Georgia, and we became good friends. We began to correspond since I could not visit with her often.

In 1907, I was employed by the Bailey Mfg. Company, of Waycross, Georgia, for the installation of some huge steam equipment for their mill, and while there I was fortunate enough to meet Mr. H. Cardoza Sloan, electrical engineer for a large engineering firm in Jacksonville, Florida, who, on the basis of the work performed, employed me in June 1909 as assistant sales engineer in the large repair plant.

La Forest and I continued to write to each other and on June 8, 1909, we were married. During this period, I went on a tour of duty at Alton, Florida, to supervise the repair of some large electrical equipment damaged by fire. With the completion of this work, we returned to Jacksonville, Florida, where I served as assistant sales manager for the Florida Electric Company.

At Jacksonville, Florida, we bought a home on a large lot, and this gave us an opportunity to indulge our gardening inclinations. My wife specialized in roses, and the beautifully landscaped yard became a show-place. We were blessed with two children—a boy, William Douglas III, and a girl, Rosalie La Forest.

In connection with my vocation, I transferred to Tampa, Florida, as manager of the General Electric Supply Company warehouse in May 1919. We lived in rented quarters where gardening was pursued as best as possible until August 1929, when we moved to New Orleans. Here again, we lived in a rented home for two years while looking around for a suitable location for our permanent home. When this was found, we settled down for gardening as our joint avocation, and we became interested in *Amaryllis*, a hobby that grew and grew with the years. My wife was also active in garden club work, and other activities concerned with civic improvement.

[The reader is referred to the biography of La Forest Smith Morton for the period from 1931 to 1955. See pages 11-12.—*Editor*].

After Mrs. Morton's death in 1955, the American Amaryllis Society headquarters requested me to assume direction of the registration of Amaryllis names as well as the other activities concerned with the organization of local societies, and the Official Show Standards program because I had worked intimately with Mrs. Morton on all of these matters, and they believed that I was best prepared for this important assignment initiated by Mrs. Morton and which was so dear to her.

It was necessary to continue and perfect the standards of judging Amaryllis so that these standards could again be raised to the highest level possible, and also to organize the various Official Amaryllis Judges Instructor sections which were to function under the National Amaryllis Judges Council. Mrs. B. E. Seale of the Dallas (Texas) Amaryllis Society became the Chairman of the Council, and I have functioned as the Registrar of Amaryllis Names, and Secretary of the Council. The forms for teaching Amaryllis judging were gradually improved through the cooperation of Mrs. B. E. Seale, Mrs. A. C. Pickard, Mrs. H. J. Haydel, Mr. Robert E. Parker, Jr., and others, with the approval of National Headquarters.

The first examination for the Amaryllis Judges Certificate since the last war was taken by Mrs. Morton. Having passed the examination, Certificate No. 1 was issued to her, and she was appointed the first Official Amaryllis Judging Instructor, and by 1955, sixteen additional candidates passed the examination and received certificates. Up to the present 117 Certificates have been issued, and it is planned to give refresher courses at convenient intervals of years so that judges may be kept informed about new developments. Up to the present, the number of Official Instructors has increased to seven.

The registration of hybrid Amaryllis clones proved to be a difficult problem. By 1955, Mrs. Isabelle Parker, of Biloxi, Miss., had registered the hybrid Amaryllis clone 'Faith', and the Dutch Amaryllis breeders expressed an interest in registering their clones, but before this could be followed up, the Captain was taken away. The response of the Amaryllis breeders has been notable. They realized that it is necessary to register names first of all to obtain priority to the names, and secondly to avoid duplication of names. The result of the registration of names has been that the quality of the product has been standardized. With the correct descriptions available for the clones, the buyer has a bill of specifications and thus the dealer is not apt to substitute an inferior product. I am happy to report that the cooperation of the breeders and dealers has now been obtained, including Ludwig & Co., Van Meeuwen & Sons, W. Warmenhoven & Zonen, W. S. Warmenhoven, C. Warmenhoven, Van Waveren & Sons, Harry de Leeuw Co., Mr. Boshoff-Mostert, and breeders and growers generally, including the members of the Society who breed Amaryllis. In 1956 Ludwig & Co. appropriately registered an outstanding hybrid Amaryllis clone, 'La Forest Morton'. By 1958, ten breeders had registered clones. In 1959,

five and a half closely printed pages of registered hybrid Amaryllis clones appeared in the Amaryllis Year Book. By 1963, there are 34 active Amaryllis breeders who have registered clones since world war II.

By 1955, in addition to the Garden Circle of New Orleans, three additional local societies interested in Amaryllis had affiliated with the American Amaryllis Society—the New Orleans Amaryllis and Bulb Society, the Shasta Garden Club of San Antonio, Texas, and the Dallas Amaryllis Society. Since 1955, eight additional local societies interested in Amaryllis have affiliated with the National Society—The Amaryllis Society of Mobile, The Houston Amaryllis Society, The Hattiesburg (Miss.) Amaryllis Society, The Men's Amaryllis Club of New Orleans, The Coastal Bend Amaryllis Society, The Men's Garden Club of Valdosta, Ga., and The Greater Houston Amaryllis Club. A local Society is being organized in the Palestine, Texas, area.

There is still work to be done. A catalog of named clones has to be prepared, new named clones have to be registered, the standards for judging Amaryllis have to be kept high, additional local Amaryllis societies have to be organized, and breeders are to be encouraged to breed excellent new clones to edify the tastes of the Amaryllis enthusiasts. However, the work is past the pioneer stage from the slump due to the last war, and the energy can be devoted to conserve the gains and to make additional progress where possible.

Mention should also be made of the wonderful cooperation of Messrs. Robert D. Goedert, Mr. Claude E. Davis, Mrs. H. J. Haydel, and Mrs. A. C. Pickard in assisting with the description of the named Amaryllis clones. Particular credit should go to Mr. Edward F. Authement, who has recently assumed the post of Assistant Registrar, and who is doing an excellent job in helping to extend the goals already reached.

LA FOREST SMITH MORTON, 1887-1955

A BIOGRAPHICAL SKETCH

La Forest Smith, daughter of William Thomas, and Annie Shaw, Smith, was born May 12, 1887, at Valdosta, Georgia. She graduated from the local high school. Her father owned a large parcel of land near the City of Homerville, Georgia, where he built a home and where La Forest was able to indulge her early fondness for flowers. Her mother specialized in roses and she followed in her mother's footsteps for some time. Mr. Smith had some very fine pine timber on his property, and Mr. W. D. Morton, Sr., who was general manager of a large lumber mill at Cutting, Georgia, contracted to buy the lumber for the mill. It was through him that she first met his daughter, Ethel Morton, and in turn became acquainted with Ethel's brother, Mr. W. D. Morton, Jr., her future husband.

[See autobiography of W. D. Morton, Jr., page 7 in the present volume for account of her marriage and life with him until both specialized in Amaryllis at New Orleans beginning in 1931.—*Editor*].

Fig. 2. La Forest Smith Morton in 1954. Photo courtesy The Times-Picayune Publ. Co., New Orleans.

At New Orleans, beginning in 1931, Mrs. Morton purchased many named clones of Hybrid Amaryllis, and she had wonderful success with them. The second world war intervened. After the war she found that the various Holland growers had duplications of names, and sometimes even included bulbs not true to name. All of this was quite confusing as no great dependence could be placed in buying named Amaryllis clones—they varied in color, size and so on. Mrs. Morton visited many Amaryllis growers in New Orleans and they too were confused about the unreliable named clones. She decided that something had to be done about it, but it was a question as to how to proceed. In the 1940's she wrote to Dr. Hamilton P. Traub, Editor, American Amaryllis Society which is affiliated with the American Plant Life Society, about the problem. He explained that before the war, Amaryllis clones were marketed in the United States by American breeders. who registerd thir clones, but this was stopped by the war. The market was confined to American clones dues to the quarantine which greatly restricted the importation of bulbs from abroad. He explained that by registration the duplications were weeded out. Unfortunately, those who were active in this work before the war had either passed to their rewards, or if living, did not go back into it after the war. He suggested that Mrs. Morton assume the position of Registrar of Amaryllis clones, a post that had been vacant since the death of Prof. Ballard. She accepted this responsibility and although progress was slow at first, she persevered and as time went on success was in sight.

As one aspect of this work, Mrs. Morton, with the cooperation of the Garden Circle of New Orleans, staged the first local Official Amaryllis Show after the second world war at New Orleans in 1949 (see Plant Life 5: 49. 1949). The shows increased in size and quality each year, but it soon became apparent that something had to be done to standardize the methods of judging Amaryllis. Here again, those who had started this work before the war, as far back as 1934, did not return to it after the war. It was necessary to start all over again. Mrs. Morton, and the Garden Circle members, took up the matter with Dr. Traub at National headquarters, who suggested that Official examinations for the Amaryllis Judges Certificate, which had lapsed since the beginning of the late war, should be reinstated. He assisted in making out the first examination questions, and classes were offered under the auspices of the Garden Circle to all interested Amaryllis enthusiasts. In this way the Official Amaryllis Judges Certificate was revived with the cooperation of the Garden Circle. Later, Mrs. B. E. Seale, of the Dallas Amaryllis Society, and other local Amaryllis Societies assisted in this important work. Soon all Official Amaryllis Shows were judged by accredited judges, and the public was well pleased. There were some slight objections from a few who wanted to lower the standards for the shows, but when the arguments in favor of having only the very highest goals for all Official shows was presented to them, all eventually favored upholding the highest possible standards.

Then, suddenly, the Captain was taken away—Mrs. Morton un-

expectedly died on October 28, 1955. Mr. & Mrs. Morton had worked closely together on Amaryllis, and he had helped her whenever possible. It was natural that he should be called upon to continue the work now well started that he knew intimately and should carry it to a successful conclusion. On request from National Headquarters, he shouldered this responsibility in cooperation with the Garden Circle, the Men's Amaryllis Club of New Orleans, and other local Amaryllis societies.

[For the continuation of the account of this work see Mr. Morton's autobiography on pages 8-9 of the present volume.—*Editor*].

It should be noted for the record, that Mrs. Morton was the President for four years of the Garden Circle which is now entitled Garden Circles Amaryllis Club.

It required a sizable cabinet to house the many trophies received by Mrs. Morton (see Plant Life 11 : 15, fig. 1. 1956). She received cups for being the most outstanding member of the Garden Circle for the years 1953, 1954 and 1955. She received a cup when she was voted Life Honorary President of the Garden Circle. She received two gold keys to the City of New Orleans for her work toward founding the New Orleans municipal Amaryllis Garden, and for outstanding work toward beautifying the City of New Orleans, and for staging outstanding annual Official Amaryllis Shows since 1949. The many other awards in her cabinet of trophies were received for outstanding exhibits at the annual Official Amaryllis Shows. —*Mrs. A. J. Haydel.*

MICHEL ADANSON (1728-1806), FATHER OF THE AMARYLLIS FAMILY

HAMILTON P. TRAUB

The amaryllids as a distinct diagnosed, named and validly published systematic group can be traced back exactly two centuries—to 1763.

Previous to 1763, systematic groups below the rank of family—genera and species—had been named, described and validly published. Gaspard Bauhin (1560-1624) was among the first to recognize the distinction between species and genera. He is credited with first adequately describing species (Bauhin, 1623). He indicated the genera but did not describe them. Later, Tournefort (1656-1708), and John Ray (1627-1705) adequately described genera (Tournefort, 1700; Ray, 1686-1704).

Systematic groups above the generic level were indicated and named prior to 1763, but no attempt was made to describe or diagnose them. Pierre Magnol (1638-1715) pioneered in enunciating the concept of the "famille" stating that "plants have certain affinity which does not exist in any part considered separately but as a whole." He did not characterize any families. Linnaeus (1707-1778) toyed with the idea of grouping plants into natural groups above the generic level (Linnaeus, 1740, 1751). He grouped plants into orders that were equivalent to present day families, *but he never diagnosed or described* his orders.

Unfortunately, Linnaeus was satisfied with his static artifical sexual system (Linnaeus, 1753), for his day, in which the genera were grouped artificially on the basis of one or a few sexual characters. In this he took a backward step, and he was lost in this blind alley for the remainder of his life.

Thus matters stood in 1763, when Michel Adanson, the noted philosopher, scientist, encyclopedist, and father of theoretical systematics (see Traub, 1962), published the second volume of his "Familles des Plantes" (Adanson, 1763-64), ten years after Linnaeus had published his artificial system. In "Familles des Plantes" Adanson applied his multivariate principle—considering all of the characters on an equal basis—to the classification of the plants known to him, on the familial level. This revealed 58 natural families which he named and *adequately described* for the first time.*

Adanson ranks among the great biologists of all time. He was so far ahead of his time that his work was not fully understood until the lapse of two centuries when Sneath used the Adansonian multivariate principle in classifying bacteria, including the use of electronic computers (Sneath, 1957a; 1757b). At the time when Linnaeus (1753) championed the artificial method of classifying plants, Adanson had the genius to see that this was in fact a dead-end street, and he had the courage to say so, and to do something about it. This however cost him dearly. For a considerable time systematics fell into the hands of the nomenclaturists who set up petty rules for naming plants. They believed that the tool—the bionomial method of naming plants first consistently used by Linnaeus (1753)—was all important. If the work of an original thinker did not meet the petty requirements of their rules, his systematic groups were outlawed. Thus it happened that Adanson's original work was left unrecognized as a contribution of importance until two centuries later when the celebration of the bicentenary of the publication of Adanson's "Familles des Plantes" serves to reveal to the world the rightful place of Michel Adanson in the history of science (see Traub, 1962).

One of the families described by Adanson in 1763 is *Liliaceae* Adans.** under which he recognized and described several subgroups (sections) which are equivalent to present day subfamilies. One of these subfamilies is Section *Narcissi* (=subfamily *Narcissoideae* Adans.**). This represents the first description of the group we now recognize as the amaryllids.

A translation of the description of subfamily *Narcissoideae* Adans., from the French of Adanson (Familles des Plantes, 1763, pp 55-56) is

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* A year after Adanson described families for the first time, Linnaeus (1764) repeated himself in publishing a revised grouping of genera under natural orders, **again without descriptions.** He never graduated above this stage.

** The endings are in accordance with Art. 18, Int. Code (Lanjouw, et al., 1961).

given below. This includes also Table 1, a list of the 12 genera included, and with brief tabulation of descriptive data.

DIAGNOSIS (Description) of Subfamily **Narcissoideae** Adans. (Narcissi)[1] family **Liliaceae** Adans.

Only *Hemerocallis, Agave* and *Pothos* [= *Polianthes* L.] have fibrous or tuberous roots; the others produce a bulb, formed of entire tunics which envelop each other.

Mostly the leaves, although alternate in emerging from the bulb, diverge on two opposite sides so that they face each other. They have their origin in the sheath which is split only in *Hemerocallis, Agave* and the tuberose [*Polianthes* L.] which is the *Pothos* of Theophrastus. When broken, one can see within (the leaves), except in *Agave, Pothos* [= *Polianthes* L.], *Atamasco* [= *Zephyranthes* Herb.], *Nivaria* [= *Leucojum* L.] and *Hypoxis*, especially when dry, that they are composed of a great number of threads which resemble extremely fine silk, and are as white as snow. These [threads] can be distinguished at a glance. One can observe these [threads] also, but a great deal less, in some species of *Ornithogalum*. The threads are like spiral spring tracheae.

Their flowers are arranged in the form of a spike, a panicle or an umbel. Those which have a spike or a panicle, are each subtended by one bract; those which have an umbel are enclosed in a spathe composed of one to six valves or parts. Besides this one can see within the umbel as many bracteoles as there are flowers. In the case of the spike of *Pothos* [= *Polianthes* L.], the flowers are arranged in pairs, subtended by a common bract, which are again each accompanied by a very small bracteole.

Their perianth is united [below]; it is regular or irregular, and is situated on top of the ovary which it envelops, making up part of this organ. It makes up to one-half, or in *Hemerocallis* and *Pothos* [= *Polianthes* L.], up to two-thirds, of the ovary. It [the perigone] appears to be composed of six distinct segments [not united below] in *Acrocorion* [= *Leucojum* L.] and *Hypoxis*. Sometimes it is double inside of this process (the perigone), where a second tube develops which is known as the nectary [= paraperigone], which has the appearance of a perigone, and which accompanies the fruit to maturity [Adanson here refers to the "cup" in *Narcissus*].

They have six stamens attached at the apex of the perigone-tube [= tepaltube] or the nectary [the staminal cup in *Pancratium*], but always in such a manner that they are opposite each of its divisions.

All have only one cylindrical or conical stigma, not distinct from the style, except *Pothos* [= *Polianthes* L.] which has three medium ones.

Gethyllis, which I am naming *Abapus*, because the name *Gethyllis* has been applied to the leek by Theophrastus, undoubtedly belongs to the section [subfamily] Narcissi [= *Narcissoideae*]! as shown by its spathe, the location of its stamens and by the position of the perigone on the ovary. Of the twelve stamens attributed to it, six apparently are on the nectary as six theeth or threads, placed below the others, in a second rank as in *Pancratium*. This then conforms to all of the botanical knowledge available on the subject of this African plant until we have a more exact description.

Thus the amaryllids as a natural group were definitely characterized by Adanson in 1763. However, A. L. de Jussieu (1748-1836) who was not intellectually honest, and for the rest of his life did all in his power to downgrade the achievements of Adanson, appropriated the plant families of Adanson and included them in his "Genera Plantarum" (Jussieu, 1789) without giving due credit to the source (see Chevalier (1934), Glass (1959), Traub, (1962). Jussieu increased the

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[1] Ending according to Art. 18, Int. Code (Lanjouw, et al., 1961).

TABLE 1. List of genera with brief diagnoses included in subfamily **Narcissoideae** Adans.[1] (Sect. Narcissi) of family **Liliaceae** Adans., according to Adanson (1763). Translated from page 57, "Familles des Plantes," 1763.

Adanson in most cases cited earlier authorities than the one listed in the footnotes—1763—for his generic names. The starting point of nomenclature was arbitrarily set at 1753 in the International Code in the 19th century.

	Roots	Leaves	Inflorescence	Spathe	Perigone
Hemerocallis L.	fibrous	opposite	panicle	1 bract under each flower	tube short[2]
Agave L.	ditto	radial	ditto	ditto	ditto
Pothos Adans.[3]	tuberous fleshy	ditto	spike	ditto	tube medium
Hypoxis L.	bulb	ditto	ditto	ditto	tube absent
Acrocorion Adans.[4]	ditto	opposite	one or several per umbel	1-valved	ditto
Tanghekolli Adans.[5]	ditto	radial	ditto	2-valved	tube long
Haemanthus L.	ditto	opposite	ditto	6-valved	ditto
Atamosco Adans.[6]	ditto	ditto	ditto	2- to 3-valved[6a]	tube short
Amaryllis L.	ditto	ditto	ditto	2-valved	ditto, scales alternate with segments
Narcissus L.	ditto	ditto	ditto	1-valved	tube long; cup entire[7]
Pancratium L.	ditto	ditto	ditto	1-valved[8]	ditto; staminal cup of 12 parts[9]
Abapus Adans.[10]	——	——	——	1-valved	ditto; nectary of 6 parts[11]

[1] Ending of subfamily name according to Int. Code (Lanjouw, et al., 1961).

[2] 'tube' refers to 'tepaltube' formed by the union of the tepals for part of their length below.

[3] **Pothos** Adans., 1763, **non** L. 1753 = **Polianthes** L.

[4] **Acrocorion** Adans. 1763 = **Leucojum** L. 1753. In the text Adanson uses "Nivaria Heist." (1748), which is superceded by **Nivaria** Medic. 1790. Both are synonyms of **Leucojum** L.

[5] **Tanghekolli** Adans. 1763 = **Crinum** L. 1753.

[6] **Atamasco** Adans. 1763 = **Zephyranthes** Herb. 1821, nom. conserv.

[6a] Apparently "2-valved" refers to the 2 free tips above the tubular base; and "3-valved" refers to other species included which are now excluded from the genus **Zephyranthes.**

[7] 'cup entire' refers to the paraperigone or cup in **Narcissus.**

[8] Evidently a typographical error. Spathe is 2-valved. If he intended "1-valved" then 'ditto' would have been used consistent with rest of table.

[9] The figure '12' apparently is a typographical error since this fits under **Abapus** below as shown by the discussion under Adanson's diagnosis. See also under (11) below.

[10] **Abapus** Adans. 1763 = **Gethyllis** L. 1753.

[11] The figure '6' apparently is a typographical error since this fits under **Pancratium** above as shown by the discussion under Adanson's diagnosis. See also under (9) above.

number of plant families to 100. In the case of the amaryllids, he raised Adanson's subfamily *Narcissoideae* to familial rank, again without giving due credit. A summary of the family *Narcissaceae* (Adans.) Jussieu is given in Table 2, below:

It should be noted that six genera—*Bulbocodium, Tulbaghia, Galanthus, Pontederia, Alstroemeria,* and *Tacca*—were added, and two genera—*Agave* and *Atamasco*—admitted by Adanson, were omitted. This leaves a net total of 16 genera.

In the latter half of the 18th and early 19th centuries, the rule of priority was recognized and was usually followed as a gentleman's responsibility, but there were sometimes serious breaches in its observance. Thus, Jaume St.-Hilaire adopted the family *Narcissaceae*

Table 2. Family **Narcissaceae** according to A. L. de Jussieu, 1789

	I. Ovary superior	
Gethyllis L.[1]	**Hemerocallis** L.	**Tulbaghia** L.
Bulbocodium L.[2]	**Crinum** L.[3]	
	II. Ovary inferior	
Haemanthus L.	**Pancratium** L.	**Leucojum** L.
Amaryllis L.	**Narcissus** L.	**Galanthus** L.
	III. Genera Narcissis non omnino affins[4]	
Hypoxis L.	**Polianthes** L.	
Pontederia L.	**Alstroemeria** L.	**Tacca** Rumph.

[1] Incorrectly placed, ovary is inferior.
[2] Now included in the **Liliaceae.**
[3] Incorrectly placed, ovary is inferior.
[4] These genera are now excluded from the amaryllids.

(Adans.) Jussieu in his "Familles Naturelles" in 1805, but quixotically changed the name to family *Amaryllidaceae* Jaume St.-Hilaire (ordo Amarylleae), as shown in Table 3, below:

Table 3. Family **Amaryllidaceae** according to Jaume St.-Hilaire, 1805.

	I. Ovary Superior	
Gethyllis L.[1]	**Hemerocallis** L.	**Tulbaghia** L.
Milla Cav.	**Crinum** L.[2]	
Bulbocodium L.[3]	**Agapanthus** L'Herit.	
	II. Ovary inferior	
Haemanthus L.	**Narcissus** L.	**Galanthus** L.
Amaryllis L.	**Eustephia** Cav.	
Pancratium L.	**Leucojum** L.	
	III. Genera qui ont de l'affinité avec les Amarylliées[4]	
Hypoxis L.	**Pontederia** L.	**Tacca** Rumph.
Leptanthus Mich.	**Polianthes** L.	
Heteranthera R. & Pav.	**Alstroemeria** L.	

[1] Incorrectly placed, ovary inferior.
[2] Incorrectly placed, ovary inferior.
[3] Now included in the **Liliaceae.**
[4] These genera are now excluded from the amaryllids.

It should be noted that five genera—*Milla, Agapanthus, Eustephia, Leptanthus* and *Heteranthera*—are added to those recognized by Jussieu (1789), giving a total of 21 genera.

The lead of Jaume St.-Hilaire was followed by most later workers with the amaryllids. This led to the legalistic adoption of the present name—*Amaryllidaceae*. The nomenclatural Code is peculiar. If a sin is committed—the publication of a superfluous name—and this sin is condoned by others and emulated over a period, then the sin becomes a virtue and the illegitimate name is recognized as the acceptable one. This is the reason that the family name *Narcissaceae* (Adans.) Jussieu, a name that goes back to Adanson's subfamily has been replaced with *Amaryllidaceae* Jaume St.-Hilaire. Although the name of the family has been quixotically changed, it is still the same group first described by Adanson in 1763, and does not detract from the genius of the man who first recognized and described it. Thus Adanson is in fact the Father of the Amaryllis Family.

For the later history of the Amaryllis family from 1805 to the present time, the reader is referred to Traub (1963)—"The Genera of Amaryllidaceae."

As indicated above, Adanson was the first to describe plant families (see Traub, 1962), and the Amaryllis family is only one out of a total of 58 which he first described. It is planned to cover these additional families in a separate article later.

We are indebted to Prof. Goff of the University of Chicago for the fine Adanson Memorial Cover of this 1963 Amaryllis Year Book. The reader should also note the World-wide celebration of the Adanson Bicentenary in 1963-64 to commemorate the publication of "Familles des Plantes" in 1763-64. The main symposium is to be held at the Hunt Library, Carnegie Institute at Pittsburgh, Penna., Aug. 18-19, 1963. Those planning to attend should write directly to Dr. Lawrence at the Hunt Library.

Memorial volumes will be published giving evidence to establish the honored place that Michel Adanson holds in the history of science.

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JOURNEY FROM RHODESIA TO INDIA, 1961

SYDNEY PERCY-LANCASTER,

National Botanic Gardens, Lucknow, India

I left Salisbury on the 16th October, missing the glorious avenues of *Jacaranda* that were just coming into bloom. Bauhinia had just finished its first flush and *Spathodia* and *Delonix* were in bud. *Schizoloboum excelsum*, with huge spikes of yellow flowers surmounting a tall scarred trunk, had also reached a flowering stage. The journey down to Beira, in Mozambique, where I was to catch the steamer to India, was dull as it was the end of winter. I noticed a *Sabal* like palm growing in swampy land, mature specimens were hardly more than 12 feet high.

We left Beira in cyclonic weather which delayed the steamer and we did not reach the first Port of Call, Dar-es-salaam, till 5-30 p. m., too late to contact the Government official whose office closed at 4 p. m. We left at night and reached Zanzibar next day, I went ashore to meet the District Agricultural Officer from whom I collected a *Gloriosa* called "*G. superba*" but from the dried specimen I was given with the tubers I guess it is a form of *G. carsoni*. I noticed a fine collection of uncommon palms in fruit, specimens of *Cyrtostachys lacca, Martinezia erosa, Latania commersoni*, and many others. Stepping into a restaurant for a cup of coffee I saw two lovely specimens of *Amaryllis Mrs. Garfield* in full bloom. Two new *Sanseviera* were seen but nothing in the plant line out of the ordinary.

Our next Port was Mombasa and I had lunch at the Mombasa Club with a Gardening friend who took me to the Public gardens and drove me around. I saw a copper coloured foliage shrub that was locally called "Poinsettia," it was Euphorbiaceae right enough but not Poinsettia. The next day I accompanied my friend to the Government Nursery some 12 miles out of town and did enjoy myself. There were a large number of plants new to me, some that might have grown well in Salisbury but would never grow in Lucknow. Prices I noticed were exceptionally high, Bougainvillea Mary Palmer, which by the way is a variety that I had the pleasure of naming and distributing from Calcutta years ago, was selling at 30 shillings, in Lucknow these plants are sold at the equivalent of 3 shillings. The Bougainvillea grown here were very fine but in Salisbury too there are dozens of seedlings raised by keen gardeners who name them without any registration. There were some lovely forms of Pilea, Pellionia, Episcea, Billbergia and several Araceae. Unfortunately most of the plants that I wished to obtain were not in seed and it was impossible to get a phytosanitary certificate at such short notice.

The next Port was the Seychelles and not a hundred yards from the quay I came across an *Inga*, very close to *I. dulcis* but with red arils, seeds collected however failed to give a single plant. I saw again the *Lodoicea* and was fortunate to obtain two nuts from one fruit for the National Botanic Gardens, where they have been planted in the Conservatory. I met a *Gloriosa* like *G. superba* but differing slightly in colour, also a *Maranta* (*Calathea*) similar to one we call *M. regalis* in India, but, whereas the Indian species grows no more than 3 feet high, this variety was not less than 12 feet high and 5-6 feet in diameter! Unfortunately no one knows the names of plants. An enclosed area held a dozen large tortoises, or turtles, on which children were riding. Breadfruit, Mangosteen and Nut-meg were other uncommon plants I saw.

On the 1st November I landed in Bombay and spent a couple of very busy days seeing gardens, there are some very well laid out gardens which I was fortunate to visit. Back in Lucknow I drove to the N.B.G. after an absence of three years and found many changes. What hurt me most was the empty shrubberies, the depleted Conservatory and absence of correct names. During the floods large numbers of plants died, plants in pots were moved to higher levels but those in the ground had to stay under water for 5 days. Where transplanting had taken place names were hopelessly mixed and only after *Amaryllis* and *Cooperathes* (*Zephyranthes*) have finished flowering can I tell what is missing, and which under a wrong name. Parts of this garden were under 13 feet of water—a rushing stream that carried away an avenue of trees. The highest parts of the garden had four feet of water. The collection of years from distant parts of India, some from the Far East, had been damaged with little hope of replacement. *Cannas* and *Cooperanthes* I can soon replace with hybrid seedlings but other plants will be more difficult.

I arrived in India Bombay, on the 1st November 1961 and spent

the next two days making a round of the City and suburbs, visiting gardens and parks. There was a definite improvement in the lay out of most gardens and a nursery man friend acknowledged that he was doing good business. The climate of Bombay is humid but never too hot nor too cold, it has a good rainfall and plants do remarkably well.

I journeyed on to Lucknow, 1420 kilometres away, and arrived at the commencement of winter. The climate of this part of India is dry; in the summer our temperatures go to 112 degrees as a rule, sometimes a bit higher. Winter temperatures are in the region of 40 degrees but this year we had a cold snap and registered 30 degrees, needless to say plants suffered heavily and even dwarf trees died, *Cordia sebestena* for instance. After a wash I left my quarters for a walk round the National Botanic Gardens and what disaster I discovered among the shrubberies, Cannas, etc., I had planted three years ago. A flood in October 1960 flowed over the garden carrying away an avenue of trees and placing the grounds under water for five days, in depth from 13 feet to four feet at the highest point. Lucknow has been called the City of Gardens, (Baghs), and a hundred and fifty years ago it certainly earned the name. The Nawabs of Oudh were keen gardeners, they liked fruit and scented flowers above others but from the Prime Minister down to the rich Zamindars (Landlords) all had their private Baghs. The Queens too had their little private gardens and I have listed some 40 names of areas in Lucknow called Bagh, such as Kaiser Bagh, Wazir Bagh, Secundra Bagh, etc.: that once upon a time were the glory of the city but are now built up areas.

Kanpur only 50 miles away is a large industrial centre and the gardens there are really well laid out. I have merely passed through the city this year, on a plant collecting trip, and could not attend their Shows owing to other engagements.

In February I was called to judge gardens in Calcutta (979 kilometres from Lucknow) and spent three days seeing as much as I could of the old Capital. My father had worked for 12 years with the Agricultural & Horticultural Society of India before his death and I followed from apprentice to Secretary serving the same Society for 51 years. Garden Competitions were held annually and never were there less than 20 gardens that entered. In 1962 there were just 12. Calcutta has a very moist humid climate and plants, with few exceptions, grow very well, though roses are never first class. Vegetation is lush and foliage growth all that could be desired. Having friends among the nurserymen of the city I discovered that business had never been so good, the demand for Cacti was something new and sales were rocketing.

I was back in Lucknow for three days when I had to travel to the Capital, Delhi, 486 kilometres away. Here I helped in judging exhibits in the "cut flower" and "plants in pots" Sections. It was not as well patronised by exhibitors as shows in past years, I was sorry to see, but the feature that attracted visitors was the "International Section." Here exhibits from France, Italy, Siam, New Zealand, Malaya, Thailand and Great Britain were beautifully displayed. Two Air Lines, the

B.O.A.C. and Pan-American, also put up exhibits and I did enjoy this feast of flowers. But the Show was open on Saturday afternoon for four short hours and the exhibits thereafter auctioned for the Y.W.C.A. Large numbers of people were disappointed as they failed to see the foreign exhibits. After the Show I spent a day with a friend who took me over the city, the Government Nursery, and to a new park which is being developed on The Ridge, a backbone of rocky land on which even thorns and thistles found it hard to grow. Water is being provided in ample quantity so that there can be a large canal, grass lawns and flower beds while suitable trees are being planted to give shade and colour. It was already well patronised by picnicers from the city.

I motored to Ghaziabad, a city some twenty miles away, and fast becoming an annexe to the Capital where industries are building huge factories. The garden I visited had been neglected and I suggested a lay out that would not interfere too much with existing trees, etc.

I was back in Lucknow and spent a couple of days at my desk when I had to organise the first Rose Show under the auspices of a Garden Lovers Society of which I am the Secretary. This was a new venture and very successful, the exhibits being numerous, and fairly good, while the visitors thronged the Hall where the flowers had been arranged.

My next engagement was judging gardens in Lucknow and I got the shock of my life when papers were handed to me showing that there were 33 competitors. The three judges were at it till late in the evening; actually there should have been two sets of judges to do justice to the work for these gardens were scattered all over the city. Two days later I had my final job when I helped judging at the Lucknow Flower Show. Quality was down and in vegetables the entries were very poor. Lucknow vegetable exhibits have, in the past, been outstanding and the one tent allocated to them this year—which was not half filled—would have needed duplication a few years back. The gardens in Lucknow are large and in "the good old days" when labour was cheap, every garden had an orchard and a vegetable garden that provided the table with most of the requirements of the kitchen.

Judging from the sale of plants and attendance at Flower Shows there seems to be a revival of gardening in India. The Government and the Municipal Corporations of large Cities are taking more interest in beautifying Public Parks and all who can afford it see that their gardens are a blaze of colour, at least during the winter months. In the dry Upper Provinces of India the summer heat, plus a hot west wind, plays havoc with plants.

ALICK PERCY-LANCASTER, 1912-1961

A Biographical Sketch

Alick Percy-Lancaster was born in Calcutta, India, on July 21, 1912, being the younger of twin sons. As a boy he showed great love for plants. He was educated at North Point, Darjeeling and at St. Edmunds, Shillong.

In 1930 he was appointed to the Royal Agri-Horticultural Society of India and spent a year in training under his father before taking a three years' course at the Royal Botanic Gardens, Edinburgh from 1931 to 1934, thereafter he went to the Royal Botanic Gardens, Kew for further training. On his return to India he was appointed Gardener in charge of the Governor's Estates in Bengal, Barrackpur, Calcutta, Dacca and Darjeeling. He worked here until he was appointed Assistant Superintendent, Horticultural Division, Central Public Works Department, New Delhi. In the Capital he was in charge of the Parks, Public Gardens, and Gardens attached to Protected Monuments, and so on, and was also responsible for all roadside and horticultural work in the City. He rose to be Superintendent on the retirement of the incumbent and later became the first Director of Horticulture. During this period his services were often borrowed by other States and he traveled all over India in the course of his duty. After twenty years of horticultural service in India, he resigned and went overseas to South Africa, but ultimately settled down in Salisbury, Southern Rhodesia, where he was joined by his father and mother. Early in 1961 it was discovered that he was suffering from high blood pressure and his heart was in consequence affected. Treatment at home did not bring about an improvement so he was hospitalized. In spite of every hope held out for his recovery, he suddenly passed away on September 22, 1961. He left a widow and three sons to mourn his loss—*Sydney Percy-Lancaster.*

Editor's note.—A brief note on the passing of Alick Percy-Lancaster appeared in Plant Life 18: 13. 1962, in which it was indicated that he was engaged on the Gloriosa Breeding Project with his father, Sidney Percy-Lancaster, when he died. The date of death there should be corrected from Sept. 28 to Sept. 22.—*Hamilton P. Traub.*

ARTHUR CHEVERTON BULLER, 1874-1959

A Biographical Sketch *

Mrs. C. Victor Schweizer,

"Keerweer," Meadow Road, Rosebank,
Cape Town, South Africa

Arthur Cheverton Buller was born on July 3, 1874, at Croydon, England; and died on May 7, 1959, at his estate in South Africa. He came to South Africa in 1893; his family had destined him for the Church but he felt a greater call for farming, and as did so many of the young men of the period like Cecil John Rhodes, he too sought his future in a new country. At first Mr. Buller worked as a learner-farmer on Karroo

* Written by Mrs. C. Victor Schweizer in 1961 at the request of Mr. Leon Boshoff-Mostert.

The information as to the dates of birth and death, and place of birth, of Mr. Buller, was furnished by The Hon. Mrs. J. M. de Villiers, daughter of Mr. Buller, in 1962.

The manuscript was received too late for inclusion in the 1962 issue and had to be held over for the 1963 volume.

farms where ostrich, sheep and cattle were raised. The conditions were most primitive; climatic conditions were extreme—drought, fierce heat, and bitter cold rang the changes with none of the ameliorations which modern conditions have brought; even traveling in cattle trucks was a relief from the tedium of animal-drawn transport. After five years, Mr. Buller moved to one of the most beautiful and fertile parts of the world at Banhoek near the then small town of Stellenbosch, where he bought a farm, "Dwarsriviershoek," for the purpose of growing fruit and vines in the wonderful scenic setting of mountains and valleys a few miles from the Cape Coast, with its superb Mediterranean climate. Here he was associated with the famous fruit grower who was sponsored by Rhodes, H. E. V. Pickstone, and the great statesman of the period, John X. Merriman, in pioneering the deciduous fruit industry. Later he experimented in cooperation with K. B. Quinan of nearby Somerset West in growing export grapes. Buller was one of the first to use the overhead trellising of vines, and specialized in methods of packing fruit in a period when cold-storage was unknown; successfully packing grapes for the long overseas journey in sawdust at one stage.

Buller was a passionate lover of wild life and his farm was a sanctuary for the fast disappearing fauna and flora of the district. He took a great delight in photography and in time became an expert color-photographer. Though so constantly behind the camera, he was a most retiring model himself with the result that there are virtually no photographs of him apart from the compulsory Identity Card—a pallidly inadequate one taken in 1955.

Horticulture was his greatest delight, and he was renowned for his exhibition sweet-peas, roses and daffodils, until he became absorbed in *Amaryllis* (syn.-Hippeastrum).

Buller developed a system for propagating *Amaryllis* vegetatively by cutting up the bulbs; he also designed his own "incubator" for their propagation, until he had built up the first collection in South Africa, one of the best in the world. He corresponded and collaborated with breeders in the U. S. A., and in the United Kingdom, including Lionel de Rothschild who held him in high esteem. Eventually a selection from his collection was accepted for the royal gardens at Windsor Castle. With *Amaryllis* his interests were centered in blooms of one pure color or shading; he bred right away from the striped effects, and the funnel-shape, getting enormous wide-faced blooms in pure white, glorious crimson, and orange; one of his triumphs was the brilliant flame-colored, 'African Glow.'

Latterly he took a great interest in the proteas for which his farm was so naturally suited, and concentrated on the fabulous *Protea cynaroides*, leaving at his death a unique plantation of this magnificent indigenous plant; fortunately these plants in their setting are being cherished by his daughter as a fitting memorial to this far-sighted protector of indigenous plants.

Among other friends of his earlier life was the well-known gardening correspondent of the London Illustrated News, Clarence Elliott; their life-long friendship and mutual interest resulted among other things

in the exporting to England of the large-lipped exquisite hardy herbaceous *Salvia azurea* christened "*African Skies*" by Buller, a luminous clear sky-blue many shades lighter than the sapphire blue of the *Salvia azurea* (type).

Fig. 3. Arthur C. Buller in 1955. Photo furnished by the Hon. Mrs. J. M. de Villiers, daughter of Mr. Buller.

Some 10 years before his death, Mr. Buller became interested in importing American Iris and making a collection of *Iris kaempferi.* At this time he ordered some Iris from "Kleinskuur" Iris Farm in the Transvaal. When forwarding the order, Mrs. Boshoff-Mostert returned Mr. Buller's check and asked Mr. Buller if he would let her have some Amaryllis for her husband in return. This he did and during the next three years gave Mr. Boshoff-Mostert a wonderful selection of hybrid Amaryllis from his collection as it then was. Mr. Buller visited the

Boshoff-Mosterts at "Kleinskuur," and Mr. Boshoff-Mostert visited with Mr. Buller at his estate, "Dwariviershoek", and was initiated into Buller's techniques and methods. From 1952 onwards, Mr. Buller continued to breed and build up what he called his "exhibition stuff" with which he did not part during his lifetime. After his death, the final collection—the culmination of all his years of breeding—was acquired by Howie's the well-known Cape horticulturists.

A charming introduction to South Africa was made when Clarence Elliot sent Buller seeds of *Leucocoryne ixioides odorata*, the Chilean "Glory of the Sun". Buller was very public spirited and opened his garden to the public for a small entrance fee, resulting in handsome sums for charity as people flocked to view the beauties of "African Skies", "African Glow", "Glory of the Sun", and the proteas. This tall fearless man was a stalwart in the district where he was a respected authority when he served on the Deciduous Fruit Exchange and Stellenbosch District Council; his influence and example will continue as an inspiration to all nature lovers.

NURSERYMAN GETS TWO YEARS *

A 35-year-old Tampa nurseyman convicted of stealing $570 worth of amaryllis bulbs from another nurseyman was sentenced to two years in prison yesterday.

Criminal Court Judge Carl C. Durrance imposed the prison term on Robert Lester Solomon, who operated a nursery with his parents at 3806 42nd St.

A jury found Robert guilty last October, but acquitted his parents. Mr. and Mrs. Horace Solomon. They were all accused of stealing 664 bulbs last March from August Bosserez, who operates Bosserez Nursery at 6215 North Himes Ave.

* Reprinted from the Tampa (Fla.) Tribune, Jan. 23, 1962.

EDITOR'S MAIL BAG

Mr. H. Speight, 4 Band Street, Lathlain Park, Western Australia, writes that he is interested in obtaining seeds of *Amaryllis* species in the Belladonna Group. He is a home gardener interested in the Amaryllis family and invites correspondence.

Prof. Douglas D. Craft, of the Chicago Institute of Fine Arts, who has served the Society faithfully as Artist since 1959 has had to curtail his load due to increased responsibilities at the Institute, and thus he has relinquished the position as Artist for the Society. However, he continues his interest in the Society and the amaryllids. The Society owes him a debt of gratitude for his excellent art work for the covers and plates in the Amaryllis Year Book in the past. His articles on amaryllid culture are also much appreciated.

We are pleased to announce that Penrith Brien Goff, Assistant Professor of German, University of Chicago, has assumed the duties as Artist relinquished by Prof. Craft. Prof. Goff's first artistic contribution appears in the present issue.

Miss F. Weber, Dip. Hort., M. A. C., Wiri, R. D. 1., Manurewa, Auckland, New Zealand, writes that she is interested in Nerines and other amaryllids, and invites correspondence.

Mr. and Mrs. W. R. Collings, 1300 Crescent Drive, Midland, Michigan, visited with the editor on January 23, 1962. The enjoyable visit was all too short.

On March 4, 1962, the editor enjoyed a visit from Mr. and Mrs. Lewis Lloyd, 4516 D'Hemecourt St., New Orleans 19, La. The Lloyds are enthusiastic amaryllid growers.

Mr. Zvi Ginsburg-Gazit, of Gevim Bulb Nursery, Gevim, Doar-Na Hof Ashkelon, Israel, writes under date of April 2, 1962, that the following amaryllids are native to Palestine: *Sternbergia spofforthiae, S. colchiciflora, Pancratium maritimum, P. parviflora* (=*Vagaria parviflora*), and possibly *P. sickenbergii, Ixiolirion montanum, Narcissus tazetta*, and *N. serotinus*.

William Morris, 20 Mills St., Warners Bay, New South Wales, Australia, writes under date of May 22, 1962, that he has started on work leading to the Master of Science (M. Sci.) degree at the University of New South Wales, having chosen as a beginning a survey of the Australian Crinums for their alkaloid content.

Mr. E. A. Angell, of Loma Linda University, Calif., visited the editor on May 28, 1962, bringing two very large bouquets of the Angell Strain of *Amaryllis* hybrids which he developed over a 24-year period from two original bulbs . . . . . . the value of this work is to reveal what species originally went into the large-flowered *Amaryllis* hybrids as shown by the characters in the progeny. The flowers show evidence of at least eight species—*Amaryllis belladonna* L. (color); *A. vittata* (vittate color pattern fragrance); *A. psittacina* (color pattern); *A. pardina* (pardina color with minute dots); *A. aulica* and *A. correiensis* (color and shape); *A. reginae* (shape and color); and *A. calyptrata* (yellow-greenish cast in some flowers). The Angell hybrids are generally 4-flowered, but some have up to 6 flowers in the umbel.

The editor received a most enjoyable visit from Mr. & Mrs. A. J. Haydel of New Orleans, La., on July 1, 1962.

We are sorry to report that Mr. C. J. van Til, general manager, and his wife, director and principal shareholder, of Ludwig & Co., were killed in September 1961, in a motor car accident. The remaining sorrowing members of the firm are carrying on. An outstanding new Amaryllis clone will be named 'Happy Memory' in fond remembrance.

Mr. G. E. de Vries of the Atlantic & Pacific Bulb Distributors of Savannah & Atlanta, Bulb Importers, representing Howie's B. C. Buller South African strain of Hybrid Amaryllis, writes under date of Sept. 29, 1962, that the firm will have a *very limited* number of high quality

bulbs (vegetatively propagated clones), sizes 26, 28, 30 & up c. m. (=circumference), available on the basis of reservation in *early spring*. Those interested should write directly to the firm—A. & P. Bulb Distr., Box 225, Savannah, Ga. This firm also handles American and Dutch hybrid seedlings—A. & P. Bulb Distr., 3479 Rockhaven Circle, N. E., Atlanta 5, Ga.

Mr. Arthur Hoerl, 4321 Vantage Ave., North Hollywood, Calif., writes that he grows many *Haemanthus katherinae* bulbs and usually harvests many seeds which he offers to share with the other members. Those interested should write directly to Mr. Hoerl.

Mr. Rory McEwen, born in Scotland in 1932, great-great-grandson of John Lindley, the renowned English botanist; educated at Eton and Cambridge (honors in Literature); served two years as officer in Cameron Highlanders; art editor of "The Spectator" for three years; collaborated with Sacheverell Sitwell on a book of "Old Pinks and Carnations"; and who lives and works in London, staged an exhibit of Amaryllis and other floral paintings, Nov. 27 to Dec. 22, 1962, at Durlacher Bros. Gallery, 538 Madison Ave., New York City. Those interested in acquiring such paintings should write directly to Mr. George Dix, owner of the Durlacher Gallery, or to Mr. McEwen at 9 Tregunter Road, London S. W. 10, England.

[**PLANT LIFE LIBRARY**, continued from page 154.]

TREE GROWTH, edited by T. T. Koszlowski. Ronald Press, 15 E. 26th St., New York 10, N. Y. 1962. Pp. 442. Illus. $12.00. This important book includes symposium papers by a large number of authorities on various topics relating to the growth of trees, including the physiological mechanisms, environmental influences, and methods of measuring growth; and also growth correlations, historical events, silvicultural implications, and tree improvement. This outstanding book is highly recommended.

ORNAMENTAL SHRUBS OF CALIFORNIA, by L. Enari. Ward Ritchie Press, 1932 Hyperion Av., Los Angeles 27, Calif. 1962. Pp. 214. Illus. Paperback. $5.95. The purpose of this book is (a) to provide a means of identification of 277 native and/or introduced ornamental shrubs grown in California; and (b) to stimulate research on taxonomic problems concerning them. The botanical descriptions, reinforced by the 181 line drawings, have been prepared from living material and have been checked with the published accounts. A comprehensive key precedes the descriptions. Highly recommended.

THE COVERED GARDEN, by K. Lemmon. Museum Press, 26 Old Brompton Road, London, S. W. 7, England. 1962. Pp. 284. Illus. 30/- net. The English term "Covered Garden" as used here is equivalent to "gardening under glass" or "greenhouse gardening" in American English. The author traces the evolution of gardening under glass from the beginnings in ancient Greece and Rome to the orangeries and hot-houses in Europe of the 17th and 18th centuries, and on to later developments up to the present time: the techniques of glass-house construction and maintenance—glass, heating, ventilation and shape. The reader is introduced to the "Age of Grace", the "Conservatory Era", the role of plant hunters, the "Jungle pool", and "Orchidaceous Beauty", and "Decline and Fall". The book ends on the note of the glasshouse of the future. Highly recommended.

[**PLANT LIFE LIBRARY**, continued on page 36.]

1. REGIONAL ACTIVITY AND EXHIBITIONS

RECORD-BREAKING FREEZE, JAN. 11-12, 1962

[The record breaking freeze of January 11-12, 1962 in the New Orleans, Houston, and Hattiesburg areas made it necessary to cancel some of the Official Shows scheduled in the spring.—*Editor*]

THE GARDEN CIRCLE OF NEW ORLEANS.—The Official Garden Circle Amaryllis Show was canceled because some of the members, including the writer lost Amaryllis bulbs that were not protected. Potted plants that were heavily mulched and in an inclosure were completely frozen. In many cases bulbs planted in the open with crowns exposed were heavily damaged, but bulbs with crowns below the surface were not damaged. The latter bloomed very late and thus could not have been used as show material. In the past we were among those staging outstanding Official shows, we preferred canceling instead of having an inferior showing.

We are planning an outstanding Official Garden Circle Amaryllis Show in 1963 and the tentative dates for this Show are April 6-7, 1963. We are looking forward to many beautiful horticultural specimens and arrangements which will be open to all Garden Clubs and individuals.

—*Mrs. A. J. Haydel, Show Chairman.*

THE HOUSTON AMARYLLIS SOCIETY.—The Official Show of the Houston Amaryllis Society had to be canceled in 1962 due to the unusually hard and prolonged freeze at a crucial period in the development of the plants and thus reduced the number of prime Amaryllis flower scapes essential to maintain the usual high standards for our exhibits.

The Society has completed plans for the 1963 Spring show and will follow its usual practice of adhering to standards which reflect the values wanted by the local group and the National organization.

—*Mrs. Frances G. Boone, Corresponding Secretary.*

OFFICIAL AMARYLLIS FORUM OF MOBILE SHOW 1962

ROBERT E. PARKER, JR.

The high point of the 1961-62 year for the members of the Amaryllis Forum of Mobile was their second annual competitive amaryllis show held on April 21 and 22, 1962 at the Kate Shepherd Elementary School, under the direction of R. E. Chason, Chairman, and Russell Ludlow, Co-Chairman.

Despite record-breaking low temperatures during the winter, a large number of entries were received in the various classes in the open competition. The theme of the show was "In Old Mobile" in keeping with the two hundred and fiftieth anniversary of the city which had been celebrated the previous summer in various community activities.

The theme table (see Figure 4) was dramatically displayed with a single vase af amaryllis blooms of various kinds—on either side of the centerpiece were holders displaying the six flags under which Mobile has lived.

Fig. 4. Amaryllis Forum of Mobile—upper, theme table 1962 Show, flags represent the nations under which Mobile has lived. Lower, educational display; shown are the chairmen of the Show (see text), with the special winter study on soils.

There were four major divisions, with some ten classes, in the competitive sections, including artistic arrangements. There were also individual hobby tables prepared by members to add to the decor of the show and to exhibit the range of varieties within the respective hobbyists' collections.

An important non-competitive feature of the show was the educational display on soil and soil components, with special emphasis on texture of soil and the elements, both primary and secondary and the trace elements. (See Figure 5 which shows the display table. Shown are Russell Ludlow on the left and W. A. McCollum who were responsible for the winter study on soil).

Judging was by official Amaryllis judges and the trophies, which were awarded this year for the first time, went to W. A. McCollum, Club Trophy for best potted American Amaryllis; H. R. Young, Greer's

Fig. 5. Amaryllis Forum of Mobile—general view of the competitive section showing part of the entries at the 1962 Show.

Trophy for best cut specimen of American Amaryllis; Mrs. H. A. Allen, Club Trophy for best potted Dutch hybrid by color; Mrs. A. B. Palmer, Hammel's Trophy for best potted Dutch hybrid; and Mrs. Earl Parker, Courtney Memorial Trophy for best cut specimen of Dutch hybrid by color.

Other trophies were awarded to Mr. W. T. Brown, Russell Ludlow Trophy for best cut specimen of Dutch hybrid by named clone; Mrs. C. D. Dean, President's Trophy for best new seedling; Mrs. H. A. Allen, Swetman Challenge Cup for best novelty or miniature; and Mrs. Russell Ludlow, Club Trophy for best artistic arrangement.

Special awards were given to Mr. and Mrs. Robert E. Chason and to Mr. and Mrs. W. A. McCollum for their hobby table displays, also the Men's Garden Club of Mobile received two (2) special awards for their attractive table display. The Swetman Sweepstakes Trophy was won by Mrs. Earl Parker for the most blue ribbons in the show.

As can be seen from the listing above, there were a very large number of trophies awarded which heightened the enthusiasm and added to the spirit of friendly competition. (See Figure 5 for a general view of the competitive section.)

The retiring officers of the Amaryllis Forum are W. O. Cobb, President; W. A. McCollum, Vice-President; Mrs. Ellen Boe, Secretary, and R. E. Chason, Treasurer.

OFFICIAL AMARYLLIS SOCIETY OF MOBILE SHOW, 1962

MRS. J. A. BROWN, JR., *Secretary*

The focal point carried out the theme of the show, a large globe of the world suspended from the ceiling surrounded by baskets of Amaryllis in the background.

The Amaryllis Society was under the leadership of Miss Mildred Laughlin as President, 1961-1962.

The members of the Amaryllis Society of Mobile, Alabama suffered a very great loss in the extreme 7 degree weather we had here in Jan. of 1962 and it seemed almost impossible to stage a show, but the members decided to put on a show to be as good as possible. To the delight of all members and every one who saw our show on April 14th and 15th, it was the best we had ever staged.

There were seven new Trophies added this year making twenty in all.

Swetmen Amaryllis Garden of Gautier, Miss., awarded to the winner of the most blue ribbons in the combined Dutch Hybrid potted and cut division a large silver tray with handles.

Robert Hiram Swetmen Memorial Trophy was awarded to the winner of the most blue ribbons in the Dutch Hybrid potted amaryllis division—silver tray with handles.

Wesley J. Marshall, Sr. Memorial Trophy was awarded to the winner of the most blue ribbons in the Dutch Hybrid cut amaryllis division—silver tray with handles.

The following annual trophies were awarded:

The Swetmen Challenge cup for most blue ribbons in the Dutch named clones division—sterling silver cup.

The Amaryllis Society of Mobile Hobby Trophy for most outstanding Hobby collection of Amaryllis—silver cup.

The Amaryllis Society of Mobile Trophy was awarded for the most blue ribbons in the unnamed cut seedlings division—silver sandwich tray.

The Amaryllis Society of Mobile Trophy was awarded for the most blue ribbons in the unnamed potted seedlings division—silver sandwich tray.

Our show had many beautiful artistic arrangements (of amaryllis only) and an Art exhibit for both seniors and juniors; with trophies awarded to all classes.

The general show chairman, Mr. Wilmer Smith, was assisted by Mr. J. W. Hanelein, Mr. Maxwell Stewart and Mr. Fritz Templin as co-chairmen. Mr. W. R. Lowe was master of ceremonies.

Fifteen accredited judges judged our show and awarded twenty trophies.

The Amaryllis Society of Mobile, Alabama with a membership of about one hundred is now making plans and looking forward to 1963 and a bigger and better show.

A welcome awaits every one who visits us at any time, but especially when we stage our 1963 show, which will be about the middle of April. That time of year seems most favorable for our Amaryllis.

OFFICIAL CORPUS CHRISTI AMARYLLIS SHOW, 1962

Mrs. Carl C. Henny, *Secretary*

The Coastal Bend Amaryllis Society held its third Official Amaryllis Show in conjunction with the Lola Forrester Flower Show April 7th and 8th, 1962. The Lola Forrester Flower Show of Corpus Christi, Texas is held each spring, with thirty three or more garden clubs within the city participating. The Theme this year was "The Seven Lively Arts".

Mr. R. E. Raasch served as president of the Coastal Bend Amaryllis Society for the year. Mr. and Mrs. R. E. Raasch were in charge of the staging of the Amaryllis Show. Mr. and Mrs. Charles Sanders served as chairmen of the Placement Committee. All members assisted by serving on the various committees. The club consists of twenty members; many of them outstanding growers of hybrid amaryllis. Most of our bulbs are garden grown, with many seedlings being planted. Also many hybrid amaryllis bulbs are ordered from Ludwig & Co., Holland.

The Amaryllis Exhibit was open to members of all Corpus Christi Garden Clubs and also to residents of the city who were interested in growing amaryllis. Long tables were used to display the potted amaryllis and cut scapes. One hundred and fifty entries were made. Blooms on display were divided according to color, ranging from white, pink, salmon to the deepest of red.

Mr. Reed Rogers, Coastal Bend Amaryllis Society Member, received the Ludwig Challenge Trophy given for having received the greatest number of blue ribbons in the Amaryllis Section; a Silver Trophy for the "Queen of the Show"—named 'Apple Blossom'—for displaying the highest scoring registered amaryllis and also a Silver Trophy for the highest scoring "Cut Scape" of a garden grown amaryllis.

Mr. Fred Jones received a Silver Trophy for the highest scoring "Seedling" entered in the show. Three "Awards of Merit" and six "Preliminary Commendations" were awarded to participants for outstanding entries within the Amaryllis Exhibit.

The number of entries in the various classifications were as follows:

Class 79-A—Registered Amaryllis, pot grown Leopoldi Type	13
Class 79-B—Registered Amaryllis, Pot grown Reginae Type	1
Class 80-A—Breeders Class—Seedlings: cut scapes	50
Class 81-A—Garden Grown Amaryllis, Registered and named plants: cut scapes	20
Class 81-B—Unnamed plants, cut scapes	48
Class 82-B—Belladonna Type: cut scapes	9
Class 83-A—Miniature Type—Pot Grown	1
Class 83-B—Miniature Type—Garden Grown, cut scapes	1
Class 84-A—Species—Pot Grown	1
Class 84-B—Species—Garden Grown—cut scapes	4
Class 85 —Australian amaryllis, cut scapes	2
TOTAL NUMBER OF ENTRIES	150

Members of the Coastal Bend Amaryllis received *13* Blue Ribbons: *13* Red Ribbons, *12* Gold Ribbons and *8* White Ribbons for their entries, making a total of 46 ribbons received.

Mr. Reed Rogers, winner of the Ludwig Trophy, entered the following named Ludwig Amaryllis specimens: Apple Blossom, Bouquet, Helen, Margaret Rose, White Giant, Picotee, and Love's Desire—cut scapes.

The Accredited American Amaryllis Society Judges who judged our show were: Mrs. Jesse Haver, Mrs. A. L. Hammond and Mrs. R. H. Schmuck—all from Houston, Texas. They were very pleased with our exhibit and said that it was one of the best they had ever judged.

Despite the advent of Hurricane Carla during September, 1961, and a three-day freeze during January, 1962, everyone was amazed with the many lovely hybrid Amaryllis specimens entered in the show.

OFFICIAL VALDOSTA AMARYLLIS SHOW, 1962

VIRGINIA CULPEPPER

[The following report is based on an article by Virginia Culpepper which appeared in the Valdosta Times, April 16, 1962.]

Termed an outstanding success by all who attended was the 6th Annual Official Valdosta Amaryllis Show held on Saturday and Sunday afternoons (April 14 and 15, 1962) at the Garden Center Auditorium.

The Official Show was held in cooperation with the American Amaryllis Society, and was sponsored by the Men's Garden Club of Valdosta. It drew visitors from several near-by cities in Georgia and north Florida, and was well attended.

Mr. Robert D. Goedert, foremost commercial dealer in Amaryllis of Jacksonville, Fla., commented that the exhibit of blooms was worthy of any show of its kind in the South or on the West Coast. Among the

other distinguished visitors was Mr. Sam Caldwell, the well-known horticulturist of Nashville, Tenn.

Awards were made in Class 1. Named clones in pots (horticulture); Class 2. Unnamed seedlings in pots (arrangements); Class 3. Named clones as cut scapes (horticulture); Class 4. Unnamed seedlings as cut scapes (arrangements); and Class 5. Hybridizer's Class, seedlings in pots (horticulture). A special award was made to the only commercial exhibitor, Mr. Robert D. Goedert, who also donated imported bulbs to winners in the Court of Honor. McDonald Nursery also received a commendation for the attractive setting of the Show which included blooming orange trees in redwood tubs and other evergreens.

Mr. Hulyn Smith, President of the Men's Garden Club, and Guy Rice, Show Chairman, both stated that they were well pleased with the Show and the interest displayed by the public. "Let's grow more Amaryllis next year" was the comment heard on all sides by those viewing the blooms.

The judges of the Amaryllis Show were honored on April 14 at a luncheon given by Mr. and Mrs. Guy Rice at their home on Gornto Road.

OFFICIAL HATTIESBURG AMARYLLIS SOCIETY SHOW, 1962

Mrs. V. J. Lucas, *Hattiesburg, Miss.*

The theme of our 1962 Official Show was "determination." In spite of rain, sleet and snow, the members staged a Show.

Sweepstakes award was made to Mrs. Johnnie Jackson who won ten blue ribbons. Mrs. Ruth Bethea won the award for the most outstanding Dutch type seedling. Mrs. Leonard Broom won in the potted Dutch hybrid class with 'Wyndham Hayward', and in the Indian Dutch hybrid class with 'Fairy Queen'.

Mrs. Johnnie Jackson was the winner in the potted American hybrid class. Miss Donna McCaffery won the sweepstakes in the junior division with five blue ribbons.

Awards of Merit were awarded to Mrs. L. Bond, Mrs. M. W. Lancaster and Mrs. Johnnie Jackson. Silver trophies were given to all top winners. The Judges praised the quality of the blooms exhibited.

THE GREATER HOUSTON AMARYLLIS CLUB

Mrs. W. S. Wheeler, *President*

The Greater Houston Amaryllis Club was organized in June 1962 with 19 charter members, and with a membership limit of 25. All members are also members of the American Amaryllis Society which is affiliated with the American Plant Life Society.

We meet once each month in the homes of the members and view the gardens of its members. We are planning a Show in the spring of 1963, weather permitting. Mrs. W. S. Wheeler is President, and Mrs.

Walter D. Wells has been appointed Official Show Standards Chairman in order to keep informed on the proper procedure for staging Official Shows. We have five accredited Amaryllis Judges in our present membership. Some of our members have been growing Amaryllis for twenty years or more.

MEN'S AMARYLLIS CLUB OF NEW ORLEANS 1962 SHOW

Henry P. Fontcuberta

The Fifth show of the Men's Amaryllis Club of New Orleans was held on April 7th and 8th, 1962, at the Edward Hynes School, 990 Harrison Ave., and in spite of the cold winter we had a good amount of entries. Comments indicated the show was a huge success. Registered attendance was five-hundred-and-fifty-six (556), but we estimated about

Fig. 6. Mr. W. R. Latapie; and grand prize table. Men's Amaryllis Club of New Orleans Show, 1962.

seven-hundred (700) to eight-hundred (800) viewed the show. The show was also viewed by many out-of-town visitors from Baton Rouge, Prairieville, Hansville, Luling, Thibodaux, Raceland, Belle Chase, Bastrop, Shreveport, Covington, Destrehan, Port Sulphur, in Louisiana. There were visitors from out pf the state, too,—Mobile, Ala., Kansas City, Mo., Timmonsville, S. C., Gautier, Miss., Lincoln, Mass., Schofield, Wis., Dana, Ill., Chicago, Ill., and London, England.

Awards in the *Horticulture Section* were received by: Walter R. Latapie—Steckler Seed Co. Award of Merit (Dutch); Walter R. Latapie—Reuter Seed Co. (Sweepstakes); Tim Calamari, Jr.—Newsham Becnel Award of Merit (American); Milo Virgin—Men's Amaryllis Club Award (Most blue ribbons won by a member); Stephen Gasperecz—Men's Amaryllis Club Award (Outstanding Seedling); Walter R. Latapie—Sweepstakes Ribbon (Dutch Class); Edward Authement

and Tim Calamari, Jr.—were tied for the Sweepstakes Ribbon, American Class; Ribbons were awarded for First, Second, Third and Honorable Mention winners.

Awards in the *Arrangements Section* were received by: Walter R. Latapie—Men's Amaryllis Club award (scapes with two florets); and A. J. Haydel—Men's Amaryllis Club Award (single florets).

Mr. Frederic Schmitz, Assistant Professor of Horticulture, Plaquemine Parish Experimental Station, Diamond, La., showed colored slides and held discussions on Amaryllis, which were enjoyed by all who viewed the show on Sunday afternoon, the 8th.

Chairman of the show was Henry P. Fonteuberta. Co-chairman: Walter R. Latapie.

AMARYLLIS JUDGES CERTIFICATES

Since the last report in the 1962 Amaryllis Year Book (pages 25-26), the following named Amaryllis Judges Certificates have been issued by the American Amaryllis Society.—

103. Mrs. Roy T. Sessums, 125 Magnolia Drive, Metaitie, Louisiana (Horticulture only).
104. Mrs. M. E. Shelton, 1856 Willow, Liberty, Texas.
105. Mrs. E. H. Blankenship, 811 LeGrun, Houston 8, Texas, (Horticulture only).
106. Mrs. Leon G. Cox, 5643 Edith, Houston 36, Texas (Horticulture only).
107. Mrs. R. L. Culpepper, 2824 Lockett, Houston 21, Texas (Horticulture only).
108. Mrs. Joe B. Faries, P. O. Box 589, Liberty, Texas (Horticulture only).
109. J. R. Gebhart, 432 Euclid Ave., Houston 9, Texas (Horticulture only).
110. Mrs. David W. Hallam, 731 Kuhlman Road, Houston 24 ,Texas (Horticulture only).
111. Mrs. J. H. Tabony, Jr., 3713 Gulf Street, Houston 17, Texas (Horticulture only).
112. Mrs. K. Virgie Fortier, 5919 Paris Ave., New Orleans 22, La. (Horticulture only).
113. Mrs. Paul Merritt, 523 Turquoise St., New Orleans 24, La. (Horticulture only).
114. Mrs. E. J. Radke, 1319 Burbank Drive, New Orleans 22, La. (Horticulture only).
115. Mrs. J. C. Holderith, 5835 Chamberlain Drive, New Orleans 22, La. (Horticulture only).
116. Mrs. John J. Kieffer, 6501 Wuerpel St., New Orleans 24, La. (Horticulture only).
117. Mrs. W. Alvin Caserta, 5900 Chatham Drive, New Orleans 22, La. (Horticulture only).

ADDITION TO SECTION II. FLORAL ARRANGEMENTS

The following classes have been added to those already admitted in this Section:

Explanation.—There are now many unnamed and unregistered Amaryllis bulbs being put on the market. It would be unfair to allow these to compete with the registered clones admitted in Section I. HORTICULTURE, and thus this addition has been made to accomodate these in Section II. FLORAL ARRANGEMENTS by allowing exhibits in groups with separate entries for cut scapes and potted plants. Such exhibits in groups may receive first, second or third prize ribbons on the same basis as those given to the regular floral arrangements in Section II.

(A)* 3 to 5 of the same kind (all identical)
- Class a.* Cut scapes
- Class b.* Potted plants

(B)* More than 5 of the same kind (all identical), not included under (A)
- Class c.* Cut scapes
- Class d.* Potted plants

(C)* 3 to 5 all different
- Class e.* Cut scapes
- Class f.* Potted plants

(D)* More than 5 all different, not included under (C)
- Class g.* Cut scapes
- Class f.* Potted plants

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* These letters may be changed to other letters or numbers so as to fit into any show schedule.

[**PLANT LIFE LIBRARY**, continued from page 26.]

PLANTS: AN INTRODUCTION TO MODERN BOTANY, by V. A. Greulach and J. E. Adams. John Wiley & Sons, 440 Park Av. So., New York 16, N. Y. 1962. Pp. 557. Illus. $7.50. This outstanding new text by authorities on the subject was written for students who specialize in botany, and also for those who pursue it as part of a liberal education. The text has a refreshing new look, and is in four sections: (1) economic botany—kinds of life; (2) levels of plant organization—molecular, cellular, tissue, organ, and organization and community; (3) plants in action—plant physiology and physiological ecology, and (4) individuals and lineages—reproduction, heredity, evolution and origin of life. This attractive text is highly recommended.

THE PHOTOSYNTHESES OF CARBON COMPOUNDS, by Melvin Calvin and J. A. Bassham. W. A. Benjamin, 2465 Broadway, New York 25, N. Y. 1962. Pp. 127. Illus. $6.00. This report on organic syntheses associated with the carbon reduction cycle in unicellular algae is based largely on experimental evidence obtained in the authors laboratory. The topics discussed include—carbon reduction cycle of photosynthesis and evidence in support of this; the carboxylation reaction; balance among synthetic pathways; photosynthesis vs. other forms of biosynthesis; amino acid synthesis; carboxylic acids; carbohydrates; fats; pigments; aromatic nuclei; other biosynthetic products. This book is highly recommended.

[**PLANT LIFE LIBRARY**, continued on page 55.]

2. LINEAGICS

[DESCRIPTION, CLASSIFICATION, EVOLUTION, AND PHYLOGENY OF LINEAGES]

AMARYLLIS STARKII SP. NOV.

Ira S. Nelson and Hamilton P. Traub

Bulbs of this plant were collected in Bolivia by the senior author in 1958, when not in bloom. They bloomed in 1960, 1961 and 1962 at the University of Southwestern Louisiana Ornamental Horticulture Center.

Fig. 7. *Amaryllis starkii* Nelson & Traub, *sp. nov.*, 1- and 2-flowered scapes.

A scape in flower, bulb and leaves were shipped air mail to the junior author in March 1962 for identification. Its subereet posture, sub-actinomorphic perigone, the relatively small bulbs, and the glaucescent leaves set it off from the rest of the *Amaryllis belladonna* Alliance, and

Fig. 8. *Amaryllis starkii* Nelson & Traub, *sp. nov.*, 2-, 3- and 4-flowered scapes; capsule and seeds in upper right.

it represents an undescribed species. It is remarkable that small bulbs may produce scapes with a single flower, but the same bulbs after another year's growth may produce scapes with 2-, 3-, or 4-flowered umbels. It is also characterized by the relatively short, stout tepaltube, and other particulars as indicated in the full description.

The flowers of this species are long lasting (up to 9 days in cultivation), and it should thus prove valuable in breeding hybrid Amaryllis which will produce sub-regular flowers with sub-erect posture.

The new species has been named for Mr. and Mrs. H. J. Lutcher Stark, of Orange, Texas, in recognition of their contributions for ornamental plant explorations, and as a token of esteem in which they are held by the authors.

Amaryllis starkii Nelson & Traub, **sp. nov.**

Bulbus globosus; foliis lanceolato-loratis glaucescentibus; scapo subcylindrico; spatha 2-valvata lanceolata; umbella 1- vel interdum 2—4-flora; pedicellis 2.5 cm. longis; ovario 3-loculato, ovulis per loculo multis; tubo tepalorum crasso 1.8—2.2 cm. longo; perigonio infundibulariforme suberecto; segmentis tepalorum subactinomorphis 6.4—8.2 cm. longis, 2.2—4 cm. latis; staminibus paulo infra apicem tubi tepalorum insertis, paulo declinato-adscendentibus, quam stylo paulo brevioribus; stigmate capitato breviter trilobato; capsula 3-loculata multiseminata; seminibus D-figuratis planis.

Roots heavy-fibrous to 5 mm. in diameter close to bulb and tapering to tips, well branched 10 cm below bulb, white. *Bulb* globose somewhat flattened longitudinally, to 7.5 cm in diameter, 5.5 cm in height, white. Neck very short, to 1.2 cm long. *Leaves* glaucescent, mostly present at anthesis, 2 to 7, lanceolate-lorate narrowing toward base then widening again at base, to 39.5 cm long, to 3.0 cm wide at base, to 2.2 cm wide at narrowest point, to 3.5 cm wide at widest point 1/3 of length below apex, tapering to bluntly acute apex, flattened V in cross section. *Scape*, sub-cylindrical, somewhat more flattened toward base and at attachment point of spathe valves, hollow, 18.5 cm to 25.6 cm long, 1.0 cm to 1.3 cm in diameter at base, 6.0 mm to 8.0 mm in diameter at apex. *Spathe valves* 2, lanceolate, erect, very light greenish-yellow with infolded margins which shrivel at anthesis, 10.0 cm long, 0.9 cm at base. Several filamentous bractioles present. *Umbel* usually 1-, sometimes 2—4-flowered. *Pedicels* 1.7 cm to 2.5 cm long, 0.4 cm in diameter. *Ovary* 0.8 cm to 1.0 cm long, 4.0 mm to 7.0 mm in diameter, roughly triangular in cross-section. *Tepaltube* stout, widening at apex, 1.8 cm to 2.2 cm long, 1.1 cm to 1.4 cm in diameter at apex, green tinged. *Perigone* funnel shaped, nearly erect, declined at approximately an angle of 12.5°, limbs spreading but not recurved, tepalsegs overlapping for lower ¾ of their length. It is among the most regular-flowered species found in the genus—the perigone appearing sub-actinomorphic; delicate satiny azalea pink (RHCC-618/1) or "strong reddish orange" (Nickerson Color Fan 7.5 R 6/12) in color on inside and outside; throat whitish with greenish-bands, nearer to white in center of the throat, with greenish white in between. *Paraperigone* absent, or nearly so, *Tepalsegs* oblanceolate, highly regular. *Setepalsegs* mucronate, upper seg 6.4 cm to 8.1 cm long, 3.4 cm to 4.0 cm wide, Lower two segs 6.8 cm to 8.2 cm long, 3.5 cm to 3.7 cm wide. Two upper petepalsegs 6.4 cm to 7.6 cm long, 2.4 cm to 3.2 cm wide. Bottom seg 6.6 cm to 7.8 cm long, 2.2 cm to 2.7 cm wide. *Stamens* 6, inserted 2 mm below apex of tube, filaments 3.9 cm to 4.5 cm long, white to greenish below, colored same as the perigone above; fasciculate, only slightly declinate-ascending. Anthers 5.0 mm long, pollen bright yellow. Stamens shorter than style and not exserted beyond the perigone. *Style* 7.6 cm to 8.8 cm long, colored as the perigone. *Style* extending about 7 mm beyond the stamens, and not exserted from the perigone. *Stigma* capitate, very shortly 3-lobed. *Fruit*, 3-celled, many-seeded capsule, 2.9 cm in diameter rupturing at maturity. *Seed*, flattened, D-shaped, very thin and paper-like, turning black at maturity, to 1.3 cm long, 0.9 cm wide. *Cytology*, somatic chromosome number 2n=22. *Habitat*, 950 m altitude. Growing in light sand-humus mixture which overlays gray

bedrock to a depth of 40 cm or more, partial shade exposure. Rainfall seasonal, temperature mild, frost free throughout the year. *Range* extent not known, type colony relatively small, does not exceed 100 clones in the immediate vicinity of a place known locally as the "Natural Arches" about 3 Km southeast of Santiago, Bolivia.

AMARYLLIS CHIONEDYANTHA SP. NOV.

MARTIN CARDENAS, *Bolivia*

This species was collected by J. Saavedra at Cueva de Monos when he was traveling from Rio Sajta to Puerto Villarroel. We received the plants from him for our *Amaryllis* collection. This species is related to *Amaryllis fragrantissima* (subg. Macropodastrum) previously described in Plant Life by the present writer. It differs from this however in its longer flower, which is the longest among *Amaryllis* known to us, in its clearly cylindrical tepaltube and the yellow-greenish spathe valves.

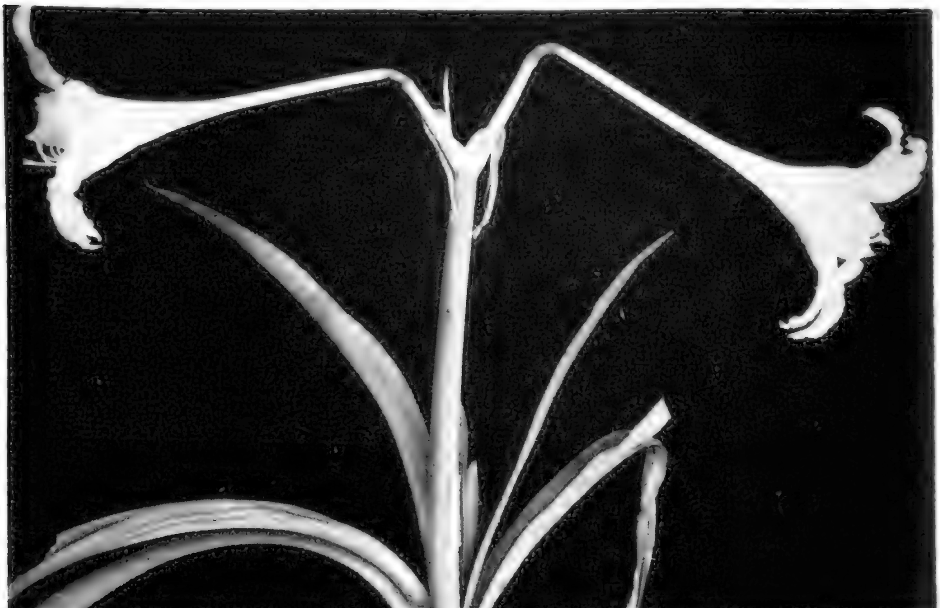

Fig. 9. *Amaryllis chionedyantha* Cardenas, *sp. nov.*, plant in flower, side view.

Amaryllis chionedyantha Cardenas, **sp. nov.**

(Macropodastrum) Bulbo magno, 10 cm. long. Pseudocollo brevi, crasso. Foliis plus minusve 12, deorsum deflexis 35-55 cm long., 5-5.5 cm latis. Scapo 40-50 cm long., basim 2-3 cm crasso, glauco viride. Umbella 2 flora. Bracteis spathaceis 11-14 cm long., diluto viridibus. Pedicellis 4 cm long., viride albescentibus. Floribus 28-30 cm long. Ovario cylindrico 1.5-2 cm long., 7 mm crasso, trigono, curvato, atro viride. Tubo 10-14 cm long., 7 mm crasso supra ovarium, inferne viridiscenti, superne niveo. Setepalsegmentis lanceolatis 15 X 3 cm, mucronatis in labro undulatis, niveo albis. Petepalsegmentis lanceolatis 13.5 X 2.5 cm, deflexis in ore undulatis, niveo albis. Staminibus 9-12 cm long. Filamentis albis. Antheris 1 cm long.

curvatis. Stylo plus minusve 11 cm long. albo. Stigma trifida. Lobis 7 mm long. albis.

Patria: Bolivia: Provincia Carrasco. Cueva de Monos in itinere Antahuacana—Rio Sajta, 500 m.

Herbaceous 50—60 cm tall plant. Bulb large, 10 cm long with a short and thick neck. Leaves distichous about 12 deflexed 35-55 cm long, 5-5.5 cm wide, fresh green. Scape 40-50 cm long, grayish green, 2-3 cm thick at base and 2 cm thick at the apex. Umbel 2 flowered. Spathe valves 11-14 cm long, yellow greenish. Pedicels 4-6 cm long, 8 mm thick, very light green. Flowers 28-30 cm long, 19-20 cm limb. Ovary dark green, trigonous, curved, cylindric, 1.5-2 cm long, 7 mm thick. Tepaltube 10-14 cm long, 7 mm thick at base, white greenish below, snow white above. Setepalsegs lanceolate, mucronate, undulate at the borders, 15x3 cm, pure white. Petepalsegs uneven. Laterals lanceolate 13.5 X 2.5 cm. Lower one narrower, 2 cm wide. All petepalsegs snow white and curled at the edges. Stamens inserted at the tube apex, 9-12 cm long, curved at the apex. Filaments pure white. Anthers 1 cm long, curved, yellow. Style not longer than stamens about 11 cm. long, white. Stigma trifid with 7 mm long white lobes.

Fig. 10. *Amaryllis chionedyantha* Cardenas, *sp. nov.*, view into flower.

Bolivia: Province of Carrasco. Department of Cochabamba. On the way from Antahuacana to Rio Sajta. Cueva de Monos J. Saavedra, June 1958. Holotype (nomenifer): No. 5541, in Herbarium Cardenasianum. See Figs. 9 and 10.

HYMENOCALLIS VENEZUELENSIS TRAUB, SP. NOV.

Hamilton P. Traub

On May 30, 1962, Blydenstein (no. 390 = US 2,370,539) collected a *Hymenocallis* species new to science at Estero de Camaguán, State of Guárico, Venezuela, where it is "Fairly common in low wet areas during the first weeks after the start of the rainy season. The leaves die off after the flowers wither."

Hymenocallis venezuelensis Traub, **sp. nov.** (Amaryllidac.)

Bulbus globosus; foliis linearibus; scapo usque ad 34.5 cm. longo; spatha lanceolata; umbella 5-flora; ovario sessile globoso; ovulis per loculo 3 vel 4; tubo

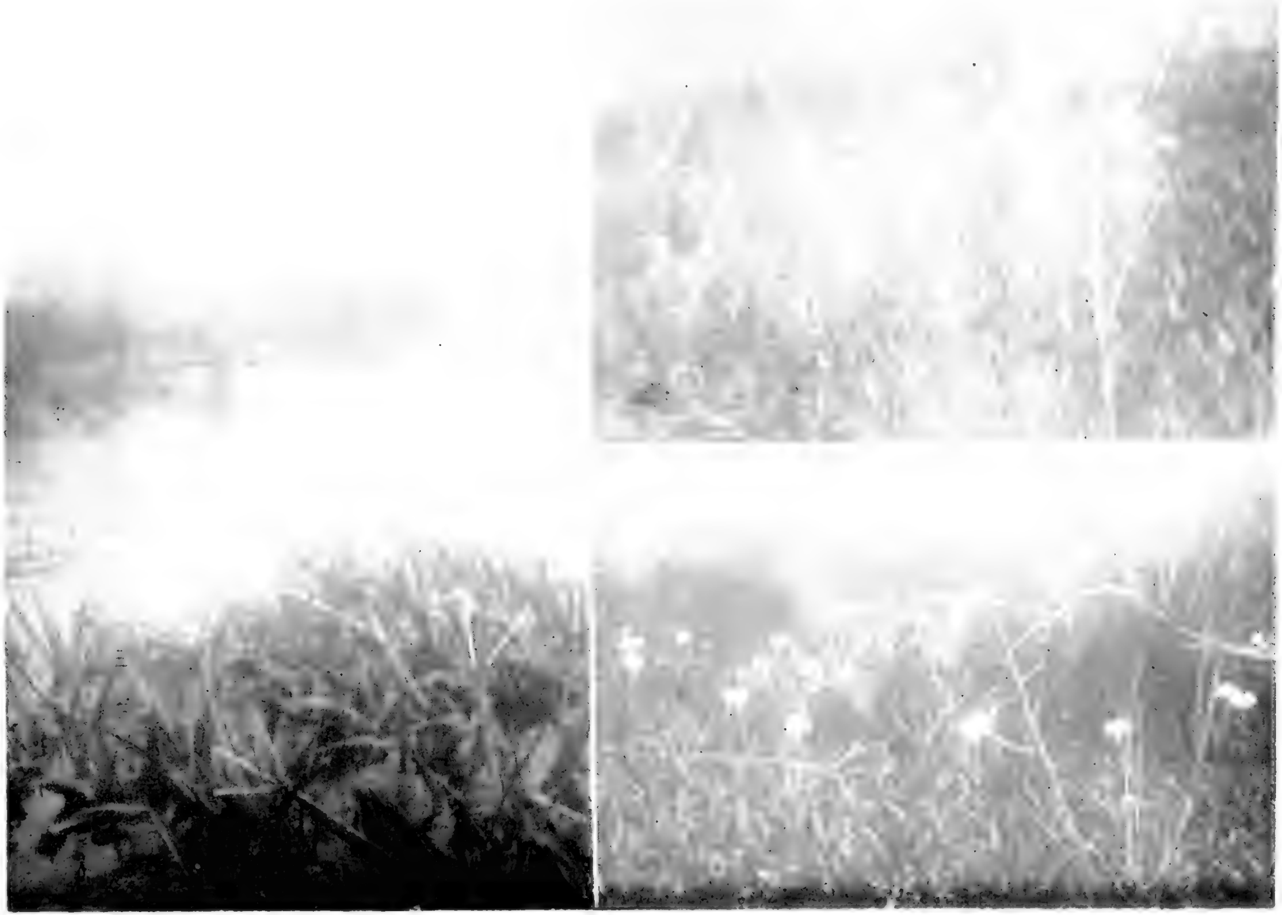

Fig. 11. Right, upper and lower, **Crinum strictum,** on the Neches River, in Jefferson County, on the southeastern edge of the City of Beaumont, Texas, in a small bayou.

Left, **Crinum strictum** var. **traubii,** in overflow swamp on east side of Neches River, in Orange County, within the City limits of Vidor, Texas.

Photos taken on a cloudy day, by Mrs. Carl Shirley.

tepalorum 8.2—8.5 cm. longo; segmentis tepalorum linearibus 7.8—8.2 cm. longis, 0.5 cm. latis; cupula staminorum infundibulariforme 3.5—4 cm. longa; filamentis 2.7 cm. longis; antheris versatilibus; stylo quam staminibus paulo longioribus; stigmate capitato.

Bulb 4.5 cm. long, 4.2 cm. in diam. (globose), neck 6 cm. long, 2 cm. in diam. *Leaves* several, linear, 26-33-36 cm. long, 1.4 cm. wide below the middle, narrowing gradually to a bluntly acute apex. *Scape* 34.5 cm. long, about 1 cm. in diam. in lower part, narrowing somewhat toward the apex. *Spathe* lanceolate, apex bluntly acute, or acute-truncate. *Umbel* 5-flowered. Lower 2/3 of tepaltube greenish, upper 1/3 yellowish-green, rest of flower white. *Ovary* sessile, globose, 1.3-1.8 cm. long, 0.9-1.0 cm. in diam.; ovules 3—4 per cell. *Tepaltube* 8.2-8.5 cm. long. *Tepalsegs* linear, 7.8-8.2 cm. long, 0.5 cm. wide, apex acute. *Staminal cup* funnel-shaped, 3.5-4 cm. long, margins rising about 0.5 cm. between the filaments, slightly irregularly incised. *Filaments* 2.7 cm. long. *Anthers* versatile, 1.5 cm. long, pollen greenish-yellow. *Style* slightly longer than the stamens; stigma capitate, bluntly 3-lobed.

Holotype (nomenifer): Blydenstein 390 = US 2,370,539, Estero de Camaguán, State of Guárico, Venezuela, May 30, 1962.

This species belongs in the Henryae Alliance, subg. *Hymenocallis*, genus *Hymenocallis* (see PLANT LIFE 18: 55-72. 1962). It is related to *H. praticola* but differs from this in having a longer staminal cup (3.5—4 cm. long), and shorter filaments (2.7 cm. long).

ADVENTURES WITH NATIVE CRINUMS

MRS. CARL SHIRLEY,

1540 Forsythe Street, Beaumont, Texas

Many native Crinums and Hymenocallis can be found along the banks of the Neches River that separates Jefferson and Orange counties, in the central eastern part of Texas. Since childhood, I have been familiar with these "spider lilies" as they are known in this area. My Dad and I spent many hours on the rivers and bayous fishing from a boat and these were always blooming during the summer months. The term "spider lilies" covers both *Hymenocallis and Crinum* and few seem to have noticed the difference. *Hymenocallis* start to bloom very early in the season and the Crinums follow—from early July through November.

Some bulbs were collected in September, 1960 near the City of Beaumont, Texas, almost in sight of the skyscrapers (see Fig. 11). The City lies on the banks of this river. Dr. Traub has identified one sent him as *C. strictum*. Some were in bloom at the time. Later, we collected seeds, but I do not know if they were seeds of *C. strictum* or of *C. americanum* which is an earlier bloomer. Most of the seeds were large, with antenna-like tops.

To reach these, my husband, Carl, and I had to go by boat as there is no known road leading to any of the places where they are found. Otherwise, these would be inaccessible, as there is about six miles of swamp on the Orange County side of the river and it is really "primitive," infested with cottonmouth moccasin snakes that will keep you in the boat. A few bulbs can be found scattered along the river banks, but usually are in small overflows from the river or up a little slough where they seem to seek protection, either from the cold or the waves

from the boats going up and down the river. Without exception, these plants were on the North or East side of the banks, which puts them in Orange instead of Jefferson County.

The tides from the Gulf of Mexico affect this river. The bulbs are always covered with some water and at times completely covered, foliage and all. As the tides recede, the water level changes and rarely can one find them growing where there is no water over them. Salt water also backs up into the river and I am sure, at times, it is really "brackish." It was found to be salty fourteen miles up the river recently.

The soil is heavy clay, black and mucky. Bulbs are usually barely covered to the neck, but some are about one-half out of the soil. We found only one place where you could get on the bank to collect them, and this was at low tide. We collected a few and Dr. Moldenke has identified them as *Crinum strictum* var. *traubii.* We did not venture over an area greater than five by ten feet. In this small area, we found tracks of deer, raccoon, mink, bobcats, nutria and others we could not identify. Evidently they had come to drink from the river.

It is my belief that *C. americanum*, *C. strictum*, and *C. strictum* var. *traubii* grow together as they are scattered blooms in most places at different times of the summer and fall. I will check these more closely next year and bring in more bulbs from different places to grow and further check the blooming season of each. The blooming time for *C. americanum* is early July to August; *C. strictum* apparently blooms in September; and *C. strictum* var. *traubii* flowers in October and November, and even later into December in cultivation in California.

We checked for bulbs up and down the river from the City of Beaumont for a distance of about ten miles or more. We found them to range that far. They are noticeably scarce along the most traveled part of the river, indicating they would be washed loose and float away from that area. My husband and a friend checked these by flying over them and they report that there are some deep into the swamp or marsh, but they could not tell whether they were crinums or Hymenocallis.

To collect them might take four or five trips before you can find them again. During the rainy seasons, the water in the river is up and they are covered. If the water is down, the tide might be in. So, they have to be checked when everything is just right. And you will decide to dig most of them without getting out of the boat!

Under date of October 10, 1962, Mrs. Shirley writes:—

You asked for the locations of collection: Figs. 11, right, were of the pink ones which we found up a small bayou just in the southern edge of the City of Beaumont off the main course of the Neches River, on the east bank which would be apparently in Jefferson County and within the City limits. The others (Figs. 11, left) are from a greater distance in the overflow or swamp. This was across the main course, up a bayou just north of the City and on the Orange County side (considered part of the City of Vidor, Texas). Orange and Jefferson counties are separated by the Neches River and Beaumont is in Jefferson

County. The River runs almost due north and south. Vidor is east of Beaumont 6 miles, and the swamp is between them. The bulbs were found on the north side of the Bayou. There are a very few scattered bulbs on the south side of the shores. There they grow in water almost without exception. The tide affects even the bayous and the water may recede enough so that they are uncovered, but with the next tide they are again covered, at least a few inches, or up to 18 inches so that the leaves barely show.

LOUISIANA CRINUMS

Barry W. Clark, *New Orleans, Louisiana*

We have been collecting native crinums for several years now, and have noticed some variation in *Crinum americanum.* This plant is generally of two different types in the wild. The first type is remarkably uniform in flowering and growth habits. The plants are small, compact with short leaves, and bear four flowers per scape. The plants generally bloom at one time.

The second type is much more variable in all respects. The individual plants may bloom from spring to late summer and each scape bears 2-4 flowers. Some plants have flowers with twisted and curled tepalsegs. The leaves are long and are of shaggy growth. We are growing both types under nearly identical conditions to determine if the differences are due to environmental conditions or represent natural variations.

Another type of *Crinum* collected is what we believe to be *C. strictum,* which has not been up to now reported as growing in Louisiana. This plant is not plentiful in the wild, but should be propagated so it could be widely cultivated. *C. strictum* is easily distinguished by its rough edged sub-erect leaves and the tepaltube which remains during seed maturation. Our plants differ from the previously described type plant in being larger with longer leaves and tall flower scapes.

There may be 2-5 or 7 flowers (var. *traubii*) on a 24 inch scape. No bulbs were observed with six flowers. In the wild only a few seeds are produced, but with hand pollination under cultivation, many more result.

Both of the above Crinums deserve to be more widely grown because of their open faced fragrant flowers which measure up to 9 inches in diameter and are pure white with carmine red stamens and style. Anyone who has Crinums surely should have these two in their collection, as they make an excellent show, especially when planted in masses.

REFERENCES

Traub, H. P. Robust Form of Crinum Americanum? Plant Life, 1958, page 51.

Traub, H. P. Long Lost American Crinum Found. Plant Life, 1962, page 47.

VARIATION IN CRINUM FLACCIDUM

L. S. Hannibal

For some hundred years there has been considerable confusion over *Crinum flaccidum* Herb., and in several instances the plant has been keyed out and published with the caption of *C. pedunculatum*, a *Crinum* which resembles *C. asiaticum*. The confusion increased when a number of variants were recently collected and flowered in Australia. The general trend of the discussions indicated that there was difficulty concerning the subgenera classification—Whether the flowers exhibited bilateral symmetry as in subgenus *Codonocrinum*, or radial symmetry with lance like tepalsegs which identifies subgenus *Platyaster*. And to add to the confusion there was no agreement as to the arrangement of

Fig. 12. *Crinum flaccidum*, yellow-flowering form, near Pichi-Richi Pass, Flinders Range, South Australia; spring growing and flowering.

the stamens, whether spreading or if contiguous and declinate. Photographs indicated both conditions and also disclosed that the tepaltube lengths varied significantly, that some were slightly curved, and that in some the tepalsegs formed a funnel form arrangement while in others they opened flatly (patent) as in *C. americanum*. The one thing in common was the long slender recurving foliage which tends to drop down upon the ground. Preliminary surmises were that there were two or more similar species involved which belonged to different subgenera. The fact that white, pink, and yellow or cream colored blossoms were available tended to bear this out.

Finally a yellow flowered form was flowered at the Los Angeles

Arboretum (Fig. 12), only to be followed by a bulb in the writers greenhouse. The latter was from an alkaline desert area some forty miles east of Adelaide. This plant had been the cause of much of the discussion regarding identity so it received close attention. It turned out to be variable in performance. The pedicel of the first blossom was barely a half inch long when the flower-bud opened and the tepaltube was scarcely two inches long. In place of being straight as expected the tepaltube bent sharply to the horizontal with a near 90 degree turn. The setsegs were semi-deciduous, and the petsegs opened flatly with spreading stamens. The second blossom repeated the unusual pattern except that the setsegs were better formed, but the bent tepaltube and spreading anthers were quite an oddity. Then the third blossom shot up and it had a six-inch tepaltube which was not curved. In place of the tepalsegs being patent, the limb was symmetrically funnelform complete with spreading anthers. The fourth blossom was like the third, but in this instance the stamens were contiguous and declinate. Was the plant subgenus *Platygaster* or *Codonocrinum?* The stamens were noted to be attached to the base of the limb in place of the apex of the tepaltube as occurs in *Codonocrinum*. The degree of development of the attachment area determined the arrangement of the anthers. As additional blossoms opened the variations of form continued. Temperature and sunlight were noted to have some influence on the strange behavior. Then photos of the bulb which flowered at the Los Angeles Arboretum's greenhouse arrived. The stamens were all spreading. Subsequently the writer has flowered several more bulbs and a re-evaluation of collected species was made in Australia.

The possibility of several species or different subgenera being involved can be rejected. The species appears to belong to *Platygaster*. Numerous variants exist covering an area of 1500 miles diameter in scattered localities. Some forms grow on semi-bogland and others are adapted to the most arid of deserts. Two strains grow in alkaline soil with a pH of 8 to 9. All are fragrant, but some are near to sickening, particularly when conditions become humid at sundown. In the north along the Darling River basin (in New South Wales) the blossoms of Crinum *flaccidum* are completely patent. In some instances blossoms with declinate stamens prevail on some bulbs in place of spreading stamens. Often both flower types occur in the same umbel. Near Quirindi in N. S. W., plants have been found which have broad elliptical tepalsegs. In an adjacent area the tepalsegs are of varying shades of pink in place of white. The tepaltubes of all forms are long and erect. Most of the bulbs grow in overflow land and flower with the late summer rains.

In contrast the bulbs growing out in the desert east of Lake Eyre exhibit tepalsegs with an amber hue. Under the arid conditions the bulbs are found down some 30 inches away from the heat and nearer to moisture. Root systems spread twelve feet in diameter have been noted. Flowering occurs in the early spring when a heavy rain occurs. Since less than three inches per annum of rain falls, the bulbs often remain deciduous for several years.

Usually patent shaped blossoms with slender tepalsegs are found along the flood plains of the Murray River in South Australia. The prevailing color is white but amber is not uncommon. However the plants found growing up on the higher alkaline terraces tend to have funnel-form limbs and often display slightly curved tepaltubes. Those about Mannum are most representative. The most striking variant is the yellow flowered strain found growing in the rocky Pichi-Richi pass in Flinders range, which is 200 miles north of Adelaide. These bulbs have funnel-form blossoms with relatively short tepaltubes, and also seem to be quite hardy to our winter conditions. Of all the types this group appears to be most promising for California gardens.

Initial tests indicate that *C. flaccidum* is a good breeder. Crosses have been effected with *Crinum moorei* and *C. pedunculatum*. Dean Herbert crossed it with *C. asiaticum* sometime previous to 1835. Since our *C. americanum* is also a member of Subgenus *Platyaster* serious effort should be made to cross it and *Crinum flaccidum*. The combinations with either the pink or yellow *C. flaccidum* would be of particular interest and it is possible that the resulting hybrid would be fertile.

Further investigations are also in order in Australia, particularly in Queensland and the northern territory since several *Platyaster* forms may be subtropical variants of *C. flaccidum*. *C. pestilentis* unquestionably is a tropical variant of *flaccidum*. And finally an investigation of the species shown in Botanical Magazine 47: t. 2133, leads to the conclusion that the plant may not have had the proper growing conditions under glass in England and that the flower buds were never properly matured when they opened. This may have resulted in its classification as *Codonocrinum*.

The writer wishes to thank David Symon, Systematic Botanist of Waite Institute, and Dr. William Morris of the New Castle Hospital Biochemical Laboratory, for their generous assistance in the preparation of material which has made this study possible.

ZEPHYRANTHES HOWARDII SP. NOV.

Hamilton P. Traub

This plant was first found growing in Laredo, Texas, by Mr. Fred B. Jones on July 4, 1954. A specimen without leaves (No. 902-B, TRA) was received from him. Since there are various hybrids to be found in Texas, it was considered necessary to rediscover this plant in the wild if it were to be considered as a candidate for species rank. On one of his collection trips to Mexico, Dr. Thad Howard did actually find this plant growing in the State of Leuva Leon, in the mountains north of Monterey. He sent bulbs to the writer under date of May 14, 1956. When these bloomed on May 29, 1956, it was at once apparent that this plant was the same as the Fred B. Jones collection in Laredo, Texas. The plant comes nearest to *Zephyranthes concolor* but it differs from that species—the leaves are narrower, the flower is upright and somewhat smaller, the flower color is light yellow, the stamens are longer

than the style, and there are other differences. Thus it is in fact a species new to science. It has been named in honor of Dr. Thad Howard who first collected the species in the wild, and is noted for his outstanding *Zephyranthes* hybrids, and for his amaryllid collecting trips into Mexico.

Zephyranthes howardii Traub, **sp. nov.**

Haec species a "Z. concolor" foliis angustioribus, floribus erectis leviter minoribus flavidulis, staminibus quam stylo longioribus, et caeteris characteribus differt.

HOLOTYPE: Traub No. 900 (TRA), 5-8-58, grown from bulbs collected in the state of Neuva Leon, Mexico, in the mountains north of Monterey in 1956. Paratypes: Traub No. 902-A, 5-29-56; and Fred B. Jones No. 902-B, 3-27-56.

HYMENOCALLIS VELARDEI SP. NOV.

Hamilton P. Traub

In October 1961, Dr. Joseph C. Smith of La Mesa, Calif., brought to the writer a plant in flower grown from a bulb collected by Dr. C. Vargas, Dept. La Libertad, Prov. Trujillo, alt. 500 m. in sandy places. Dr. Smith indicated that a specimen of it could be made for the Traub Herbarium. It was at once apparent that it was a species in the subgenus *Elisena* of the genus *Hymenocallis* and nearest to *H. longipetala*. A description was made from the living plant. Since it differed from *H. longipetala* in a number of characters it was considered as a new species. It would have been named for Dr. Vargas, but there is already *Hymenocallis* (sug. *Pseudostenomesson*) *vargasii* (Velarde) Traub, which had been named for Dr. Vargas by his colleague Dr. Velarde of the University Cuzco, Peru. Thus it has been named for Dr. Velarde.

Hymenocallis (subgenus Elisena) **velarde** Traub, **sp. nov.**

Haec species a "H. longipetala (Lindl.) Macbr." praecipue pedicellis 6 mm. longis (vs. ovaria paene sessile), tubo tepalorum 5 mm. longo (vs. 6—9 mm. longo), segmentis tepalorum 7.4 cm. longis (vs. 10 cm. longis), cupula staminorum 2.4 cm. longa (vs. 3.8 cm. longa), et filamentis 5.2 cm. longis (vs. 6.4 cm. longis) differt.

Holotype: Dr. Joseph C. Smith no. 890a+b (TRA), 10-3-61, cult. La Mesa, Calif. grown from bulbs collected in Prov. Trujillo, Peru by Dr. C. Vargas.

The species differs from *H. longipetala* in having pedicels 6 mm. long (ovary nearly sessile), tepaltube 5 mm. long (vs. 6—9 mm. long); tepalsegs 7.4 cm. long (vs. 10 cm.); staminal cup 2.4 cm. long (vs. 3.8 cm.); and filaments 5.2. cm. long (vs. 6.4 cm.) long in *Hymenocallis longipetala* (Lindl.) Macbride.

LYCORIS X LAJOLLA HYBR. NOV.

HAMILTON P. TRAUB

In 1956, the writer made reciprocal crosses of *Lycoris aurea Herb.* *L. traubii* Moldk. The first of these seedlings flowered in 1961 and ers were again obtained in 1962. These plants promise to be useful mental garden plants. The characters of the parents are variously inant in the F-1 generation—leaves glabrous, spathe ovate, pedicel t and with flower shape similar to *L. aurea.* In 1962 the flowers selfed but only one seed has set. The second generation seedlings be raised beginning with this one seed and additional seeds to be ined in later years.

Lycoris x **lajolla** Traub, **hybr. nov.**

Planta inter "Lycoris aurea" et "L. traubii" in utramque partem hybrida; ae generationis primae foliis glabris, spatha ovata, pedicellis brevibus, colore aque sicut L. aurea.

The leaves are glabrous, spathe ovate, pedicels short, and flower shape and is similar to that of *L. aurea.*

HOLOTYPE: Traub no. 880a+b, 9-13-61 (TRA), grown at La Jolla, Calif.

EARLY BURSTING OF OVARY IN HYMENOCALLIS

HAMILTON P. TRAUB

In connection with the exposition of his theory of the angiosperm er, Melville (Kew Bull. *16:* 41. 1962) refers to "Gymnospermous iosperms". This condition is due to the rupture of the capsule by rential growth rates of its parts. Melville states that "such a lack oordination of growth rates might be expected in the early evolution structure like that of the angiosperm ovary." He cites various nples. To this list might be added the genus *Hymenocallis* which otorious in this respect. Unless the seeds are underdeveloped, the y walls are usually broken early in the development of the seeds h may protrude as a group so that the ovary wall is not noticeable. is particularly true in *Hymenocallis mexicana* (L.) Herb. ex Druce, arf species of easy culture which might be used as an experimental t for the study of lack of coordination of growth rates in ovary and development in angiosperms.

LYCORIS SANGUINEA AND L. "CINNABARINA"

WILLIAM LANIER HUNT, *North Carolina*

The existence of at least three different burnt orange lycorises in collection makes me begin to wonder if it is not going to take quite time and work to unscramble the sanguinea-cyrtanthiflora-koreana plex.

Two different lycorises have come to me from different sources as *anguinea* Maximowicz. The first one has flattish tepalsegs which

reflex slightly but have absolutely no crimping or curling. The hea
flowers measures 7½ inches across. Pedicels are upright, 1½ in
long. Spathe valves are 1¼ inches long and ½ inch wide after dr
(See Fig. 13.) This flower looks very much like the illustration at
3 A, Traub & Moldenke, "Amaryllidaceae: Tribe Amarylleae",
1949.

The other plant that came to me as *L. sanguinea* is only abo
third of the size of the above described plant. The tepalsegs are
crimped nor reflexed, and the total result is that of a large bright
apricot freezia. This is naturally a small plant as I have it becau
is growing in rich soil and has flowered several times as a dwarf.
mass of these would be beautiful in the summer garden, but they
small and ephemeral. (See Fig. 13.)

Lycoris "cinnabarina" looks to me like what Col. Grey calle
sanguinea cyrtanthiflora Hort. Grey, Hardy Bulbs 2: 58. 1938. (See
13.) The color of this flower is "burnt orange" HCC-014/1, one of
most stunning colors imaginable. The main differences between
plant and the larger sanguinea described above lie in the slig
crimped tepalsegs, the reddish brown pedicels (They are green i
sanguinea) and the much earlier blooming season. *L.* "cinnabari
flowers several weeks (beginning as early as July 7th, 1962) ea
than the two types of *L. sanguinea*. In fact, they just barely over
As shown in Fig. 13, seeds have formed on *L.* "cinnabarina".
is the same scape shown by itself in flower in Fig. 13. The vases are
inches tall.

By no stretch of the imagination can I get any of these three flo
to be "brick red". They are burnt orange or apricot to me. (
one, the little one, answers to the description of *L. sanguinea* as ha
"segments that are neither crisped nor reflexed" as old John Wea
says in his reliable bulb book of 1911. No matter what the tru
sanguinea is like, we certainly have three distinct plants here.

It may even be possible that there are still other types. Among
several hundred bulbs I have, there is some strange looking foliage
singles it out from its fellows in March. The foliage of all these bulb
of course, contemporary with that of *L. squamigera*. It is shorter
more grey green than that of *L. radiata* though quite similar, with
typical ridge down the back. Incidentally, in with the different bat
of *L. "cinnabarina"* have come some *L. radiata* bulbs that flower
different time from the season of any of the three types of *L. rad*
in my collection. These will bear watching for fertility possibili

L. "cinnabarina" is self fertile as will be seen by the seeds for
in the vase. There is no other amaryllid blooming at the time
flower opened except crinums. I have had a bitter contest with a l
creature that looks like a bee. [See also Herbertia 3:111-112. 193
Ed.] It has been necessary to go out in the heat of the middle of
day or in late morning and collect pollen just before anthesis ta
place because this little creature is apt to beat me to it if I am l
The minute anthesis takes place, he and his children are there gather

Fig. 13. *Lycoris* species: left, flower scapes tall form, *L. sanguinea*, tepalsegs not crisped, pedicels green, July 29, 1962; dwarf form, *L. sanguinea*, tepalsegs neither crisped nor reflexed, July 27, 1962. Scape with seed pods *L.* "cinnabarina", same as scape in flower to right, now gone to seed. Right, *L.* "cinnabarina", tepalsegs burnt orange and slightly crisped; pedicels brownish. July 7, 1962. The vases are $6\frac{5}{8}''$ high. Photos by William Lanier Hunt.

pollen and storing it on their "hind" legs. They are so greedy for it that they will almost allow me to close them up in the medicine capsules I use to store pollen. Again, as fast as pollen is brushed onto stigmas, the tiniest members of this insect family can light right on the stigma and steal it away. The larger insects have to alight in the flowers and climb out on the styles, but baby can snatch it off while flying by! If these little creatures were not so intriguing, more pollenating might be done. By repollenating the stigmas several times in the day, I seem to have overcome the difficulty because seeds have been produced right along.

Pollen of *L.* "cinnabarina" has inspired *L. squamigera* to produce lots of seeds this year—whether parthenocarpic or just dead seeds remains to be seen. Last year, after some 44 crosses on one of the new "whites", I harvested one healthy looking seed which failed, however, to come up. With a dessicator full of pollen, everything in sight is destined for pollenation from these beautiful burnt orange flowers this year.

The blooming performance of *L.* "cinnabarina" and the two sanguineas is not as good as it might be. They have been through five and three extra snowy, cold winters respectively here in middle North Carolina at 500 feet elevation. Temperatures were occasionally low in March at the time when the foliage is about grown. Low temperatures held back *Cyclamen repandum* nearby, and it seems that these lycorises were adversely affected. Only about one sixth of several hundred bulbs have bloomed, and the same has been true of *L. squamigera.*

Whatever these variations on the same theme turn out to be, they are welcome in the mid-summer garden in the South, for they are truly exotic. With any blue flowers like the veronicas, they are stunning. None of the brownish orchids is more beautiful or unusual.

SPROUTING CLIVIA CYRTANTHIFLORA SEEDS

HAMILTON P. TRAUB, *California*

In the past, seeds of *Clivia cyrtanthiflora* were planted directly in a potting medium of 1/3 each of granulated peat, coarse sand and garden loam. In each case the seeds failed to sprout, and gradually decayed. A change in procedure was indicated.

On March 23, 1961, the writer harvested 17 seeds of *Clivia crytanthiflora.* These were placed in a plastic bag together with a quantity of vermiculite which had been sparingly wetted. The closed bag was placed in the garage and was forgotten. Recently, on July 15, 1961, the writer remembered about the seeds, and was pleasantly surprised to find that 16 out of the 17 seeds had germinated with leaves 2 inches long, and roots from 2 to 5 inches long. The seedlings were then planted in the potting medium previously described. The seeds had apparently sprouted some time previously, and normally would have been potted earlier.

The writer desired selfed seedlings of *Clivia cyrtanthiflora* in order to check the statements in the literature to the effect that this is a hybrid. If the seedlings will segregate in the direction of the reported parents according to the Mendelian ratios, then the hybridity of this plant can be established. If the seedlings come true to form, then the plant is apparently a true species and not a hybrid, unless parthenocarpy is involved. This latter possibility is unlikely however.

CRYPTOSTEPHANUS VANSONII

GORDON MCNEIL, *South Africa*

Cryptostephanus vansoni Verdoorn was found by Georges van Son in 1935 in the Vumba Mountains of Southern Rhodesia. Baker places this genus near *Narcissus* due to the corona in the blossom, however the plant resembles a *Clivia*. It produces a thin flattened peduncle and the umbel of blossoms resembles that of *Tulbaghia fragrans*, particularly in the internal structure of the flowers. The segments are star shaped opening white and fading to a violet mauve. The fruit is a scarlet berry containing one or two spherical seeds some 3 mm. in diameter. The seeds take 18 months to ripen. Dr. Gouws reports the chromosome number as 2n=24. A few plants are grown for botanical interest at the Pole-Evans garden in Southern Rhodesia.

AMARYLLID GENERA AND SPECIES

HAROLD N. MOLDENKE

[In this department the descriptions of amaryllid genera and species, particularly recent ones, translated from foreign languages, will be published from time to time so that these will be available to the readers.]

Elisena sublimis Herb. Bot. Mag. pl. 3873.—scape 9 inches tall; spathe 3 inches long, 6-flowered; peduncles ⅜ths to ¾ of an inch long; limb becoming whitish, 2 inches long, surpassing the filaments by ¾ of an inch; corona about ¾ of an inch long, acutely many-dentate; style subequaling the limb or finally surpassing it by half an inch; stigma minute. Specimen collected by J. MacLean in the Andes of Caxamarquilla.

Hymenocallis adnata var. disticha Herb. Amaryll. 215. 1837.—P. distichum Bot. Mag. 44 (1879) as to the plant of Herbert, not as to the illustration. The tepaltube and segments 4½ inches long, the leaves somewhat broader and more nervose.

Hymenocallis crassifolia Herb. Amaryll. 215. 1837.—From Port Saint Mary, western Florida, lat. about 29°. Leaves thick, suberect, lorate, obtuse, canaliculate, almost 36 inches long, 2 inches wide, green; corona of the perianth almost like that in *H. caribaea*, tepaltube longer.

Pseudourceolina Vargas, Bol. Facult. Sci. Univ. Cuszo, No. 1: 7-8. 1960. Bulb pyriform, 32—35 mm. long, 22—24 mm. in diameter, the neck 15—18 mm. long; leaves produced after the time of anthesis, similar to those of the genus Eucharis, acuminate, long-petiolate; scape to 14 cm. long, 2-flowered; pedicel long, slender, pendulous; perianth yellow, urceolate to 1/3 the height, and with the stamens similar to those in the genus Urceolina, but the tepals only connate half way up; free stamens equaling the tepals; gynoecium rather long. It differs from the genera Eucharis and Urceolina in its leaves and perianth. Type species, P. robledoana.

P. robledoana Vargas, l. c. Leaves 2, produced after the time of anthesis; petioles 6—8 cm. long, slightly alate; blade 12—15 cm. long, 8—9.4 cm. wide, acuminate, obscurely parallel-veined, the acumen 6—8 mm. long; flowering scape to 14.5 cm. long, 8 mm. wide at the base; bracts yellow, membranous, 30 mm. long,

4.5—5 mm. wide; umbel 2-flowered; pedicels pendulous, 3—3.5 cm. long; ovary pale-yellow, subglobose; perianth yellow, green at the apex, 4.5—5 cm. long, the tube narrow to 1/3 its length, 1—1.5 mm. wide, finally expanding and 18—25 mm. wide; tepals connate to the middle beyond that free; stamens exserted, narrow, yellow, free; anthers 2.5—3 mm. long; style longer than the stamens; stigma more narrow; fruit not seen. The species is dedicated to Luis Maria Robledo.

Tribus *Traubieae* Moldenke, *tribus nov.*, genus Brunsvigia Heist. (Amaryllidac.)
Rhizoma bulbosa; foliis hysteranthis; scapo gracile usque ad 3.5 cm. longo; spatha bivalvata quam pedicellis longioribus; ovario inferiore 3-loculato, ovulis per loculo multis; tepalis 6 linearibus acutis patentibus, nervis 3 purpureis in centro ornatis; filamentis filiformibus purpureis quam tepalis dimidio brevioribus; antheris ad basin sagittatis quam filamentis vix dimidio brevioribus; stylo gracile purpureo quam staminibus paulo longioribus; lobis stigmatis vix aspectabilibus.

Typus: genus *Traubia* Moldenke, gen. nov. (Amaryllidac.)
Rhizoma bulbosa; foliis hysteranthis; scapo gracile usque ad 3.5 cm. longo; spatha bivalvata quam pedicellis longioribus; ovario inferiore 3-loculato, ovulis per loculo multis; tepalis 6 linearibus acutis patentibus, nervis 3 purpureis in centro ornatis; filamentis filiformibus purpureis quam tepalis dimidio brevioribus; antheris ad basin sagittatis quam filamentis vix dimidio brevioribus; stylo gracile purpureo quam staminibus paulo longioribus; lobis stigmatis vix aspectabilibus.
Typus: *Traubia chilensis* (F. Phil.) Moldenke, *comb. nov.*; syn.—*Lapiedra chilensis* F. Phil., in Anal. Univ. Chile xciii: 144-145. Lam. VI. 1896.

[**PLANT LIFE LIBRARY**, continued from page 36.]

TAXONOMY OF SETARIA (GRAMINEAE) IN NORTH AMERICA, by J. M. Rominger. University of Illinois Press, Urbana, Ill. 1962. Pp. 132. Illus. This monograph on the 43 species of the North American foxtail or bristle grasses incorporates the research reported in the literature of the past 40 years relating to the taxonomy, morphology, cytology, anatomy, geographical distribution and economics of *Setaria*. The author has studied about 6,000 pertinent herbarium specimens and has made field collections and observations in the course of the preparation of this monograph. Highly recommended.

FLOWERING TREES OF THE WORLD: FOR TROPICS AND WARM CLIMATES, by E. A. Menninger. Hearthside Press, 118 E. 28th St., New York 16, N. Y. 1962. Pp. 336. 425 Illustrations. $18.95. This book is based on experience gained from a quarter century devoted to the study of flowering trees for subtropical and tropical climates. In the present book, 500 of the finest flowering trees have been selected, and they are described, and many of them are illustrated in color or black and white. At the end of the book, valuable indices are included —flowering trees by special features, half-hardy trees, color of flowers, leaf color other than green, quickie guide for travelers, common and scientific names. This most attractive book is highly recommended.

COMPARATIVE PLANT ANATOMY, by Sherwin Carlquist. Holt, Rinehart & Winston, 383 Madison Av., New York 17, N. Y. 1961. Pp. 146. Illus. $5.00. This important new book is presented as a guide to taxonomic and evolutionary data in angiosperms on a comparative basis. After considering the ethics of comparison, the chapters are devoted to cellular components, epidermis and trichomes, xylem, phloem, vascularization of the shoot, root, histology of the stem, leaf, and flower and associated topics. This stimulating guide is highly recommended to all who are interested in the comparative anatomy of the angiosperms.

[**PLANT LIFE LIBRARY**, continued on page 62.]

SOMATIC CHROMOSOMES OF **WORSLEYA RAYNERI**

WALTER S. FLORY AND THELMA L. SCHMIDHAUSER,

The Blandy Experimental Farm, University of Virginia

The "Blue Amaryllis," long carried under the name *Amaryllis procera*, had its nomenclature reconsidered by Traub and Moldenke in 1949. At that time the taxon was given the new combination *Worsleya rayneri* (J. D. Hooker) Traub and Moldenke.

Traub had earlier (1939) established the monotypic genus *Worsleya*, separating it from the genus *Amaryllis* L. chiefly because of its four spathe-valves, rather than two; its D-shaped, rather than discoid, round or subglobose seed; and its bulb with a long aerial neck, rather than a bulb with no—or a very short—aerial neck.

Fig. 14. Somatic chromosomes from a root-tip of *Worsleya rayneri* (J. D. Hooker) Traub and Moldenke. 2n=42. X2500.

Worsleya rayneri has been found to have 42 somatic chromosomes (Figure 14). These may be divided into 16 longer, 8 shorter, and 18 intermediate ones so far as length is concerned. Of the 16 longer ones, one pair has approximately median centromeres, 5 pairs are submedian, and 2 are subterminal. The 18 chromosomes of intermediate length are made up of 6 pairs with submedian centromeres and 3 pairs with subterminal ones. The 8 shorter chromosomes are apparently divided equally into groups with median or with submedian centromeres. The longest chromosomes are 6 microns, and the shortest are about two microns, in length.

A number of *Amaryllis* species, in contrast, have 22 somatic chromosomes, although polyploids with 33, 44, 66 and 77 chromosomes, re-

spectively, are known. Our single bulb of *A. aulica* is aneuploid with 23 somatic chromosomes. The somatic chromosomes of *Amaryllis* range from approximately 4 to 10 microns in length, when preparations are fixed and prepared in the same way as were our *Worsleya* slides (root-tips pretreated with 0.2% colchicine 2 hours; fixed in 3:1 acetic alcohol over night; squashed in aceto carmine).

The monotypic *Worsleya rayneri* thus not only has a different chromosome number than found in *Amaryllis*, but in our preparations these chromosomes have been smaller, and there has been a slight difference in the proportions of observed types (a somewhat higher proportion of ones with median centromeres, and a somewhat lower proportion of those with subterminal constrictions)—when compared with known *Amaryllis* chromosome complements. The cytological picture thus tends to confirm the correctness of separating *Worsleya* from *Amaryllis*.

The 42 chromosomes of *Worsleya*—both in number and type—suggest, however, a possible derivation from a tetraploid *Amaryllis*, and a close affinity to the latter genus.

LITERATURE CITED

Traub, H. P. Herbertia 6:118-119. 1939.
———— and H. N. Moldenke. Amaryllidaceae: Tribe Amarylleae. 22-24. 1949.

AMARYLLID NOTES, 1963

HAMILTON P. TRAUB, *California*

HABITAT OF AMARYLLIS x MOSTERTII

This naturalized hybrid was collected by Mr. Leon Boshoff-Mostert near Acornhoek, District of Pilgrims Rest, in Eastern Transvaal Low-veld. He writes that "Reliable old-timers who have known these flowers all their lives, having grown up there, assure me that the plant can be found there in the wilds of those areas over a radius of some 30 or 40 miles." The type (nomenifer) specimen (see Plant Life *17:* 55. 1961) was prepared from a plant grown from stock propagated by Mr. Boshoff-Mostert from his Acornhoek collection.

X **Rhodobranthus molfinoi** Traub, **hybr. nov.**

Planta hybrida sterilis, spatha infra connata, interdum prope usque ad basin fisso, floribus "spinel"-rubris.

Hybrid between Rhodophiala spathacea (Herb.) Traub and Habranthus juncifolius Traub; spathe united below, sometimes almost cut to the base; flowers spinel pink. Holotype: Traub No. 601 (TRA) 9-11-57, and No. 600, 8-27-57, paratype.

When X *Rhodobranthus woelfleanus* Traub was described (Plant Life 14: 48. 1958; 15: 41. 1959), *Rhodophiala spathacea* (Herb.) Traub was included under *Rhodophiala bifida* (Herb.) Traub. Thus the hybrids of *Rhodophiala spathacea* with *Habranthus juncifolius* Traub

(Herbarium specimens Nos. 600 and 601 TRA) were included under *Rhodobranthus woelfleanus*. With the recognition of *Rhodophiala spathacea* (Herb.) Traub as a distinct species (see Plant Life 17: 55. 1961), these two specimens have to be considered as the basis of a distinct new hybrid, which is hereby named X *Rhodobranthus molfinoi* Traub, in honor of Dr. Jose F. Molfino, Director of Instituto de Botanica y Farmacologia, Buenos Aires, who sent the bulbs of the Argentinian plant that was later recognized as *Habranthus juncifolius* Traub.

Subg. **Moldenkanthe** Traub, **subg. nov.,** genus Brunsvigia Heist. (Amaryllidac.)

Umbellae multiflorae; pedicelli graciles 6-9-15-30 cm. longi; ovarium 7 mm. longum 3.5 mm. diametro; tubus tepalorum rectus 7mm. longus; segmenti tepalorum 2.8—3 cm. longi, supra mediam 3—4 mm. lati; stamina usque ad 3 cm. longi; stylus usque ad 2.5 cm. longus; stigma minutum; capsula parva acute triquetra, semine singulo globoso juxtim apex placentae posito sessile.

Differs from subgenera *Coburgia* (Herb.) Traub, and *Brunsvigia*, of genus *Brunsvigia* Heist., in having a single globose seed sessile near the apex of the placenta.

Type: *Brunsvigia kirkii* Baker, Amaryll. 99. 1888. Tanganyika: Kirk, Usagura [= Uluguru?] Mts. (fide Baker, Amaryll. 99. 1888); R. M. Davies 747= 47-220 (SRGH), Mbosi (dist.), Zambi, alt. 5500 m. 11-15-32.

Subgenus **Vallota** (Herb.) Traub, **comb. nov.,** genus Cyrtanthus (Amaryllidac.)

Syn.—Genus *Vallota* Herb., App. Bot. Reg. 29. 1821.

Type: **Cyrtanthus purpureus** (Ait.) Traub, **comb. nov.**

Note.—A new combination with "speciosus" is ruled out by the prior *C. speciosus* Dyer, Fl. Pl. S. Afr. 22: pl. 868. 1942.

Syn.—*Crinum speciosum* L. f. Suppl. 195. 1781; *Amaryllis speciosa* (L. f.) L'Hérit. Sert. Angl. 12. 1788; *Amaryllis purpurea* Ait. Hort. Kew. 1. 417. 1789; *Vallota purpurea* (Ait.) Herb. App. Bot. Reg. 29. 1821; *Vallota speciosa* (L. f.) Durand & Schinz, Consp. Fl. Afr. 5: 258. 1893 (1895).

With the description of *Cyrtanthus guthrieae* L. Bolus (in Ann. Bolus Her. 3: 76. 1921) which is allied to *Vallota speciosa* (L. f.) Durand & Schinz, the genus *Vallota* became untenable. Either the former species had to be transferred to *Vallota*, or *Vallota* had to be reduced to *Cyrtanthus*. Since species of *Cyrtanthus* cross with *Vallota speciosa* there is very close relationship, and *Vallota* has to be reduced to the earlier genus *Cyrtanthus*.

Cyrtanthus x **brownii** traub, **hybr. nov.** (Amaryllidac.)

Planta hybrida inter "C. sanguineus var. flammeus" ♀ et "C. purpureus" ♂, habitu parentis polleniferi sed foliis angustioribus, umbella nonulliflora, et floribus intermediis recedit.

Hybrid between *Cyrtanthus sanguineus* var. *flammeus* ♀ and *C. purpureus* ♂. Habit resembles pollen parent, but leaves are narrower, umbel is several-flowered; flowers are intermediate. Type: Fig. 177, in La Semaine Horticole 3: 376. 1899.

Named for the renowned N. E. Brown, of the Royal Botanic Garden, Kew, who first reported this hybrid as "Cyrtanthus hybrida" (in Gard. Chron. 24: 391 (Sept. 26) 1885, and indicated that *Vallota* should be reduced to *Cyrtanthus*. Other reports include "Vallota hybrida" in La Semaine Hort. 3: 376, Fig. 177. 1899. W. Miller & F. T. Hubbard, in Bailey, Standard Cyclopedia of Hort. ed. 1930, p. 3429; and Weston, in Herbertia 4: 188, plate 67 (on page 58). 1937.

Pancratium centralis (Chev.) Traub, **comb. nov.**

Syn.—*Mizonia centralis* Chev., in Rev. Bot. Appliq. 30: 626; 628, Pl. 33 & 34. 1950.

Lectotype of **Zephyranthes insularum** Hume ex Moldk.

In 1959, Dr. H. H. Hume kindly donated a specimen ex-10725 Hume & West (now No. 622, TRA) which is one of the specimens on which he based the original description of *Zephyranthes insularum* Hume ex Moldk. Bulbs were collected from culture at Key West, Florida by H. H. Hume and E. West, and grown at Gainesville, where the specimens were taken on June 14, 1936. This specimen is now designated as the lectotype of this species in place of temporary lectotype indicated in Taxon 7(4): 111. 1958.

Lectotype of *Zephyranthes insularum* Hume ex Moldk., Hume & West No. 622 (TRA), formerly Hume & West 10725, Herbarium, Univ. of Florida, Agr. Expt. Sta. All other Hume & West 10725 specimens are designated as isolectotypes. Traub Nos. 306 and 502 are designated as paratypes.

X **Brunserine** Traub, **hybr. gen. nov.,** (Amaryllidac.)

X **Brunserine tubergenii** Traub, **hybr. nov.**

Plantae inter species generum Nerine et Brunsvigia hybridae, habitu intermediae.
Hybrid between species of *Nerine* and *Brunsvigia rosea* (Lam.) Hann., intermediate between the genera. Type: Fig. 1, Plant Life 14: 20, 1958.

Brunsvigia rosea (Lam.) Hann. **emend.** Traub (Amaryllidac.)

Haec species solum formas tardifloras (Septembro et tardiore) prius in hoc apposite inclusas comprehendat.

Brunsvigia major Traub, **sp. nov.** (Amaryllidac.)

Haec species solum formas praecocifloras (tarde Julio per Augustam) prius in "B. rosea" inclusas comprehendat.

Holotype: Traub No. 811a+b+c (TRA), 8-30-60, originally from South Africa, specimen from plants cultivated at La Jolla, Calif. Paratype: Traub No. 835a+b+c+d (TRA), 8-10-56, cult. La Jolla, Calif.

Hymenocallis x spofforthiae (Herb.) Traub, **comb. nov.**

Syn.—*Ismene* x *spofforthiae* Herb. in Bot. Reg. 20: pl. 1665. 1834: Amaryll. 223; 224. 1837. "Sulphurea" Worsley, Herbertia 1: 56. 1934. *Hymenocallis narcissiflora* x *H. amancaes*.

Lectotype: plate 1665, Bot. Reg. Lond. *20:* 1834. *Specimen:* Traub. No. 860a+b+c (TRA), cult. La Jolla, Calif. 4-2-61.

Notes.—This plant is similar to the parents; the flowers are sulfur yellow. This cross has been repeated by others, particularly in Holland, and in the United States. The Dutch bulb dealers list a number of clones, including 'Sulfur Queen'.

Herbert (Amaryll. 224. 1837) crossed *Hymenocallis* x *spofforthiae* with *H. amancaes* ♂ and from this expected to obtain a more vigorous *H. amancaes.* He did not report further on this cross.

Herbert used the name "Hymenocallis x spofforthiae" (in Amaryll. 218; 410. 1837, *nomen nudum*) for a reported cross between *Hymenocallis rotata* var.

disciformis ♀ and *H. adnata* var. *disthica* ♂, but this never flowered, and thus was never described. Thus this is a *nomen nudum* and the name is available for a new combination.

Amarylloidinae Traub, *infrafam. nov. (Amaryllidac.)*
Paraperigonium adest vel nullum; stamina insolenter manifeste mutata. Typus: Genus *Amaryllis* L.

Pancratioidinae Traub, *infrafam. nov. (Amaryllidac.)*
Paraperigonium nullum: stamina plerumque mutata aut libera et inferne incrassata vel diverse appendiculata vel inferne in cupulo staminali unita. Typus: Genus *Pancratium* L.

Gageeae Traub, *tribus nov. (Amaryllidac.)*
Inflorescentia subumbellata vel umbellata; ovarium superius; perigonium in segmentis 6 divisum. Typus: Genus *Gagea* Salisb.

Clivieae Traub, *tribus nov. (Amaryllidac.)*
Rhizoma subbulbosa vel bulbosa sparse tunicata; scapus solidus; tubus tepalorum brevis; segmenti tepalorum 6 divaricati; fructus baccatus. Typus: Genus *Clivia* Lindl.

Stenomesseae Traub, *tribus nov. (Amaryllidac.)*
Folia sessilia vel petiolata; cupula staminalis plerumque adest vel stamina insolenter libera; semina dura angulares vel plana saepe alata. Typus: Genus *Stenomesson* Herb.

Alliinae Traub, *subtribus nov.*, tribe Allieae Kunth *(Amaryllidac.)*
Perigonium regulare, tepalis 6; pedicelli ad apicem non articulati; rhizoma bulbosa tunicata. Typus: Genus *Allium* L.

Brodiaeinae Traub, *subtribus nov.*, tribus *Allieae* Kunth *(Amaryllidac.)*
Perigonium regulare, inferne tubulosum, superne in segmentis 6 divisum; rhizoma cormosa; pedicelli ad apicem saepe articulati. Typus: Genus *Brodiaea* J. E. Smith.

Millinae Traub, *subtribus nov.*, tribus *Allieae* Kunth *(Amaryllidac.)*
Rhizoma cormosa; perigonium regulare; ovarium ad apicem gynophorii positum. Typus: Genus *Milla* Cav.

Platyphyllanthe Traub, *subgenus nov.*, genus *Galanthus* L. *(Amaryllidac.)*
Folia in vernationi convoluta. Typus: *Galanthus platyphyllus* Traub & Moldk.

Hymenocallis x *lajolla* Traub, *hybr. nov. (Amaryllidac.)*
Plantae hybridae inter H. narcissiflora et H. vargasii; floribus erectis; tubo tepalorum viridi, residuum floris album; filamenta staminorum leviter incurva; cetera parentibus intermedia. Holotypus: Traub No. 929 (TRA), 7-18-62.

Crinum x *lajolla* Traub, *hybr. nov. (Amaryllidac.)*
Plantae hybridae inter C. strictum var. traubii et C. moorei; umbella 6-flora; floribus non late patentibus; tubo tepalorum curvato: foliis tenuibus laete viridibus; cetera parentibus intermedia. Holotypus: Traub No. 938 (TRA), 8-9-62.

Nectaroscordum tripedale (Trautv.) Traub, *comb. nov.* Syn.—*Allium tripedale* Trautv. in Tr. S. P. B. Bot. Sada (A.H.P.)II: 485. 1873.

TRISTAGMA POEPP

Poeppig (1833) proposed the genus *Tristagma*, with *T. nivale* (*T. nivale* Poepp. ex Endl., 1835) as the type. This generic name has priority over *Ipheion* Raf. (1837) with a type (*I. uniflorum* (Lindl.) Raf.) which has to be transferred to *Tristagma* Poepp., on phylogenetic grounds. Baker (1871) transferred *Tristagma nivale* to the synonymy of *Milla* Cav. (1793), but such a placement is untenable on phylogenetic grounds. The species of *Tristagma* have long been recognized whereas the genus *Ipheion* Raf. has only lately (1943, 1955) been recognized to a limited

extent. The name *Gardinia* Bert. (1829) has never come into use, and thus should not be considered. Thus it would be improper to conserve the latter two over the first named. The following named species of *Tristagma Poepp.* have been described:

1. *Tristagma ameghinoi* (Speg.) Speg., in Anal. Mus. Buenos Aires 7: 172. 1902.
2. *Tristagma australe* Neger ex Dusen, in Ergebn. Schwed. Ex. Magell. III. v. 207.
3. *Tristagma chubutense* Gandoger, in Bull. Soc. Bot. France 1919. lxvi. 292. 1920.
4. *Tristagma dimorphopetalum* C. Gay, Fl. Chil. 6: 126.
5. *Tristagma eremerophyllum* Speg. in Anal. Mus. Buenos Aires 7: 171.
6. *Tristagma inflatum* Rendle, in Jour. Bot. 325. 1904.
7. *Tristagma nivale* Poepp., Fragm. Syn. Pl. Chile, 9. 1833; Poepp. & Endl., Nov. Gen et Sp. ii. 28, pl. 140. 1835.
8. *Tristagma philippii* Gandoger, in Bull. Soc. Bot. France 1919. lxvi. 292. 1920.
9. *Tristagma pulchellum* Speg. in Anal. Mus. Buenos Aires. 7: 172.

The following species described under *Beauverdia, Brodiaea, Milla, Nothoscordum,* or Triteleia, have been transferred to *Tristagma* Poeppig on phylogenetic grounds:

Tristagma violaceum (Kunth) Traub, *comb. nov.* Syn.—*Triteleia violacea* Kunth. Enum. Pl. 4: 468. 1843.

Tristagma bivalve (Lindl.) Traub, *comb. nov.* Syn.—*Triteleia bivalvis* Lindl., in Bot. Reg. 15: sub pl. 1293, in adnot. 1830.

Tristagma setaceum (Bak.) Traub. *comb. nov.* Syn.—*Milla setaceum* Bak., in J. Linn. Soc. Bot. 11: 385. 1871.

Tristagma lloydiiflorum (Beauv.) Traub, *comb. nov.* Syn.—*Nothoscordum lloydiiflorum* Beauv., in Bull. Herb. Boiss. ser. 2. 8: 998, fig. 2. 1908.

Tristagma vittatum (Griseb.) Traub, *comb. nov.* Syn.—*Milla vittata* Griseb., in Goett. Abh. 24: 318. 1879.

Tristagma hirtellum (Kunth) Traub, *comb. nov.* Syn.—*Triteteia hirtella* Kunth, Enum. Pl. 4: 465. 1843.

Tristagma felipponei (Beauv.) Traub, *comb. nov.* Syn.—*Nothoscordum felipponei* Beauv., in Bull. Soc. Bot. Geneve, ser. 2.13: 267. 1921.

Tristagma lorentzii (Herter) Traub, *comb. nov.* Syn.—*Beauverdia lorentzii* Herter, in Boissiera 7: 509, fig. 54. 1943.

Tristagma sellowianum (Kunth) Traub, *comb. nov.* Syn.—*Triteleia sellowiana* Kunth, Enum. Pl. 4: 466. 1843.

Tristagma poeppigianum (C. Gay) Traub), *comb. nov.* Syn.—*Triteleia poeppigiana* C. Gay, in Fl. Chil. 6: 117. 1853.

Tristagma porrifolium (Poepp.) Traub, *comb. nov.* Syn.—*Triteleia porrifolia* Poepp., in Fragm. synop. Phaner. Chil. 10. 1833.

Tristagma patagonicum (Bak.) Traub, *comb. nov.* Syn.—*Milla patagonica* Bak., in J. Linn. Soc. Bot. 11: 383. 1871.

Tristagma spegazzinii (Macloskie) Traub, *comb. nov.* Syn.—*Brodiaea spegazzinii* Macloskie, in Rept. Princeton Univ. Exped. Pat. 8: 305. 1903-06.

Tristagma tweedianum (Griseb.) Traub, *comb. nov.* Syn.—*Milla tweediana* Griseb., in Goett. Abh. 24: 318. 1879.

Tristagma sessile (R. A. Phil.) Traub, *comb. nov.* Syn.—*Triteleia sessilis* R. A. Phil., Linnaea 29: 72. 1857-58.

Tristagma viridor (Killip) Traub, *comb. nov.* Syn.—*Brodiaea viridor* Killip, in J. Wash. Acad. Sci. 16: 566. 1926.

Tristagma circinatum (Sandwith) Traub, *comb. nov.* Syn.—*Brodiaea circinata* Sandwith, in Hook. Ic. Pl. 5th. ser. 4: pl. 3350. 1937.

Tristagma uniflorum (Lindl.) Traub, *comb. nov.* Syn.—*Triteleia uniflora* Lindl., in Bot. Reg. 15: sub pl. 1293, in nota. 1829; 23: pl. 1921. 1837.

Tristagma gracile (R. A. Phil.) Traub, *comb. nov.* Syn.—*Triteleia gracilis* R. A. Phil., Anal. Univ. Chil. 550. 1875.

Tristagma brevipes (Kunze) Traub, *comb. nov.* Syn.—*Triteleia brevipes* Kunze, in Linnaea 20: 9. 1847.

Tristagma recurvifolium (C. W. Wright) Traub, *comb. nov.* Syn.—*Brodiaea recurvifolia* C. W. Wright, in Bull. Misc. Inf. Kew. 117. 1915.

× **Urecocharis** Mast. ex Traub, **hybr. gen. nov.** (Amaryllidac.)

Plantae inter generum Urceolina et Eucharis hybridae, habitu intermediae. Type: × *U. clibranii* Mast. in Gard. Chron. ii. 214. fig 36. 1892; and Gartenfl. xli (1892) 501.

[**PLANT LIFE LIBRARY**, continued from page 55.]

INTRODUCTORY MYCOLOGY, ed. 2., by C. J. Alexopoulos. John Wiley & Sons, 440 Park Av. So., New York 16, N. Y. 1962. Pp. 613. Illus. $12.00. This second edition of an outstanding text on mycology will surely be welcomed by all students of the subject—undergraduate, graduate and interested laymen. The author has incorporated the latest findings into his discussions on morphology, systematics, physiology and genetics. Thus it is particularly refreshing to note that he has had the courage to recast the classification of the fungi along new lines in harmony with recent research. The material is presented in four parts: (a) organisms of uncertain origin; (b) the lower fungi; (c) the higher fungi, and (d) lichens. It is to be regretted that Dr. Alexopoulos had to omit the Schizophyta due to space limitations imposed by rising publication costs. This well-written, stimulating text is recommended without reservations to all interested in mycology.—*H. P. Traub.*

QUANTITATIVE CHEMICAL TECHNIQUES OF HISTO- AND CYTOCHEMISTRY, by D. Glick. John Wiley & Sons, 440 Park Av. So., New York 16, N. Y. 1962. Pp. 470. Illus. $14.50. This first of two volumes on small volume work in quantitative histo- and cytochemistry was written for the purpose of "gathering into a more easily available and usable form the widely scattered techniques and methods" in the fields indicated. The sections of the book are (1) preparation of biological sample; (2) measurement of sample; (3) general apparatus and manipulation; (4) gasometric techniques; (5) electrometric techniques; (6) dilatometric techniques; and (7) fluorometric techniques. There is a bibliography, list of manufacturers, buffer tables, and index. This outstanding book is highly recommended to all workers in this field.

CUCURBITS, by T. W. Whitaker and G. N. Davis. John Wiley & Sons (Interscience Div.), 440 Park Av. So., New York 16, N. Y. 1962. Pp. 250. Illus. $11.50. This critical survey of all aspects of knowledge concerning the cultivated cucurbits by two outstanding authorities satisfies a long felt need. After considering the geographic origin of the important cultivated cucurbits—watermelon, cucumber, gherkin, muskmelon, dish-rag gourd, pumpkins, gourds, and chayote, chapters are devoted to (1) general morphology and anatomy, (2) taxonomy of cultivars, (3) cytogenetics and plant breeding, (4) effect of environmental factors on growth and development, (5) culture, (6) seed production, (7) diseases and insect pests, (8) harvesting, transportation, storage and marketing, and (9) composition and uses. There is a bibliography, table of conversion factors, subject and author index. The text is adequately illustrated, including one color plate. This attractive book is recommended to all interested in cucurbits.

THE MICROBIOLOGY OF THE ATMOSPHERE, by P. H. Gregory. John Wiley & Sons, 440 Park Av. So., New York 16, N. Y. 1961. Pp. 251. Illus. $10.50. This first comprehensive book by an outstanding authority in this new field of research—spore dispersal and the mechanism by which this is achieved—will be of interest to those entrusted with the control of epidemic diseases, and to all interested in the distribution of bacterial, fungal and plant life. This book should contribute toward answering such questions as to how spores become air borne, how they are transported, and how and where they are deposited. There is an extensive bibliography, a subject index and an author index. The illustrations are outstanding, including color plates for visual identification. Highly recommended.

[**PLANT LIFE LIBRARY**, continued on page 68.]

REGISTRATION OF NEW AMARYLLID CLONES

Mr. W. D. Morton, Jr., Registrar,
Mr. Edward Authement, and Mrs. Emma D. Menninger,
Assistant Registrars

This department has been included since 1934 to provide a place for the registration of names of cultivated *Amaryllis* and other amaryllids on an International basis. The procedure is in harmony with the INTERNATIONAL CODE OF BOTANICAL NOMENCLATURE (edition publ. 1961) and the INTERNATIONAL CODE OF NOMENCLATURE FOR CULTIVATED PLANTS (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "DESCRIPTIVE CATALOG OF HEMOROCALLIS CLONES, 1893-1948" by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $2.50 prepaid from: Dr. Thos. W. Whitaker, Executive Secy., THE AMERICAN PLANT LIFE SOCIETY, Box 150, La Jolla, Calif. CATALOG OF HYBRID NERINE CLONES, 1882-1958, by Emma D. Menninger; and CATALOG OF BRUNSVIGIA CULTIVARIS, 1837-1959, by Hamilton P. Traub and L. S. Hannibal, were published in 1960 Plant Life, with additions to both in Plant Life 1961. In Plant Life 1961, the first edition of THE GENUS X CRINODONNA was published which serves also as a catalog of cultivars. A catalog of Amaryllis names and also catalogs of the names of other cultivated amaryllids, are scheduled for publication in future issues.

Only registered named clones of Amaryllis and other amaryllids are eligible for awards and honors of the AMERICAN AMARYLLIS SOCIETY at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as *Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis*, and so on, should be addressed to Mr. W. D. Morton, Jr., Registrar, 3114 State Street Drive, New Orleans 25, Louisiana. The registration fee is $2.00 for each clone to be registered. Make checks payable to AMERICAN PLANT LIFE SOCIETY.

Registration of Nerine cultivars.—Under date of Oct. 15, 1962, Dr. H. R. Fletcher, Secretary, International Commission for Horticultural Nomenclature and Registration, writes, "I am happy to be able to inform you that at the XVIth International Horticultural Congress, held in Brussels in August-September, 1962, the Council of the International Society for Horticultural Science agreed to the American Plant Life Society acting as International Registration Authority for Cultivars of Nerine."

AMARYLLIS BREEDERS, 1952 TO PRESENT TIME

Edward F. Authement, *Assistant Registrar*

The following list of recent Amaryllis breeders (who have named and registered Amaryllis clones since 1952) was compiled from Plant Life, 1952 to the present time. There are other Amaryllis breeders who have not yet named and registered Amaryllis

clones. They, and others who later enter this field, will be added in the coming years in the Amaryllis Year Book.

The abbreviations were adopted after consultation with Messrs. W. D. Morton, Jr., Robert G. Goedert, and Dr. Hamilton P. Traub.

Abbreviation	Amaryllis Breeder
Beck	Mr. Ralph H. Becker, 1823 Treasure St., New Orleans, La.
BM	Mr. Leon Boshoff-Mostert, Kleinskuur, Balfour, Transvaal, So. Afr.
Both	Mr. E. Both, Adelaide, Australia
Cal.	Mr. Tim Calamari, 1623 Pauger Dr., New Orleans, La.
Clem.	Mrs. Margie Clements, 703 Ridgewood Dr., Metairie, La.
Cron.	Mrs. John F. Cronin, P. O. Box 207, Lutz, Fla.
Dorr.	Mrs. H. E. Dorr, 33 Oaklawn Dr., Metairie, La.
Dug.	Mr. R. E. Duggan, 6864 Milne St., New Orleans, La.
HDL-G.	Harry de Leeuw Co. Ltd., South Africa. Wholesalers only. Clones registered exclusively, and sold in U. S. A., by Mr. Robert D. Goedert, Jacksonville, Fla.
Eub.	Mr. R. W. Eubank, 1301 York St., Corpus Christi, Tex.
Fitch.	Mr. Charles Marden Fitch, 1120 Cove Rd., Mamaroneck, New York.
Font.	Mr. Henry P. Fontcuberta, 2717 Cleveland Av., New Orleans, La.
Gasp.	Mr. S. P. Gasperecz, 1219 Short St., New Orleans, La.
Har.	Mrs. H. L. Harris, 3645 S. Saxet Dr., Corpus Christi, Tex.
Henry	Mrs. Mary G. Henry, Gladwyne, Penna.
Kl.	Mrs. John Klein, Jr., 2504 Mistletoe St., New Orleans, La.
Lud.	Ludwig & Co., P. O. Box 18, Hillegom, Holland.
Mitch.	Mrs. Donald Mitchell, 1443 Arabella St., New Orleans, La.
Mull.	Mr. Tobby Mullen, 1814 Independence St., New Orleans, La.
Park.	Mrs. Isabelle Parker, 424 Crawford, Biloxi, Miss.
Perr.	Mr. W. J. Perrin, 4753 Press Dr., New Orleans, La.
Pick.	Mrs. A. C. Pickard, 1702 N. Blvd., Houston 6, Tex.
Raa.	Mr. R. E. Raasch, 345 Deddridge St., Corpus Christi, Tex.
Ram.	Mr. Charles Ramelli, 126 Jeff Davis Ave., Biloxi, Miss.
Schm.	Mr. Frederick B. Schmitz, Rt. 1, Box 438, Port Sulphur, La.
Sol.	Mr. Robert L. Solomon, 3806 42nd St., Tampa, Fla.
St.-J.	Mrs. Harry St. John, 2614 Holly Grove, New Orleans, La.
Terry	Mr. J. W. Terry, 1107 Mamie St., Hattiesburg, Miss.
Traub	Dr. Hamilton P. Traub, 5804 Camino de la Costa, La Jolla, Calif.
VM	Messrs. G. C. van Meeuwen & Sons, Heemstede, Holland
VW	M. van Waveren & Sons, Hillegom, Holland
CW	C. Warmenhoven, Holland. Wholesaler only. Business was started in 1962 by Cornelius Warmenhoven II. Clones registered by Robert D. Goedert, Jacksonville, Fla.
WSW	W. S. Warmenhoven, "Zonnewende", Holland. Wholesaler only. U. S. Agent, P. J. Komen, Anna Paulowna, Holland. Business started in 1923 by Willem S. Warmenhoven, the eldest son of Cornelius Warmenhoven I. Sells bulbs under brand name "Royal Dutch". Clones registered by Claude W. Davis, Baton Rouge, La.
WWZ	W. Warmenhoven & Zonen, Holland. (1860-1962). Founded by Willem Warmenhoven in 1860, who was succeeded by his son, Cornelius I, who died in 1936. His two younger sons, Simon and Cornelius II, jointly carried on the business until 1962.

HYBRID AMARYLLIS CLONES

Registered by Ludwig & Co., Hillegom, Holland:

Amaryllis clone 'Home Decorator'; reg. A-702-D5A, 7-3-62; 26"-28" high; umbel 4-fld; fls 8"-9" wide; poppy red (16/1), suffused salmon, slightly darker throat.

Amaryllis clone **'Dutch Doll'**; reg. A-703-D5A, 7-3-62; 22″-24″ high; umbel 4 or more-fld; fls. 7″-9″ wide; picotee type—dainty red edge on each pure white seg.

Amaryllis clone **'Square Dance'**; reg. A-704-D5A, 7-3-62; 26″-28″ high; umbel 4-fld; fls. 9″-10″ wide; picotee type—broad red edge on each white, slightly wavy seg; throat apple-green.

Amaryllis clone **'Streaking Stripes'**; reg. A-705-D5A; 7-3-62; 26″-28″ high; umbel 4-fld; fls. 8″-9″ wide; pure white with mandarin red stripes on each seg; throat apple green; 3 inner segs slightly bearded.

Amaryllis clone **'Trixie'**; reg. A-706-D5A, 7-3-62; 22″-24″ high; umbel 4-fld; fls. 8″-9″ wide; cherry red (722/2), changing to tyrian rose (24/1); throat slightly deeper; orange dusted in full sun.

Amaryllis clone **'Winter Carnival'**; reg. A-707-D5A; 7-3-62; 25″-27″ high; umbel 4-fld; fls. 9″-10″ wide; pure white at first with deep green throat, segs changing to a suggestion of light yellow when the throat changes to whitish.

Registered by W. S. Warmenhoven, (by P. J. Komen), Anna Paulowna, Holland:

Amaryllis clone **'Marion'**; reg. A-682-D4A; 7-8-62; 22″-23″ high; umbel 4-fld; spr.; fls. 8″-8½″ wide; white, shading to light creamy yellow on edges of segs; three upper segs marked with claret rose (021).

Amaryllis clone **'Blushing Beauty'** (formerly Rose Queen); reg. A-683-D5A, 7-8-62; 22″ high; umbel 3—4-fld; fls. 8″ wide; azalea pink (618), with underlay of white.

Amaryllis clone **'Elvira Aramayo'**; reg. A-684-D5A, 7-8-62; 20″ high; umbel 4-fld.; fls. 7″ wide; carmine red (21), overlaid with magenta rose (027), giving reddish purple effect.

Amaryllis clone **'Oasis'** (formerly Snow Queen); reg. A-685-D5B, 7-8-62; 21″ high; umbel 3—4-fld.; spr.; fls. 7½″ wide; pure white with greenish throat.

Amaryllis clone **'Golden Triumphator'**; reg. A-686-D5A; 7-8-62; 24″ high; umbel 3—4-fld; spr.; fls. 9½″ wide; mars orange (016), slightly blending to light golden orange, throat brick red (016).

Amaryllis clone **'Maryland'**; reg. A-687-D5A; 7-8-62; 20″ high; umbel 3—4-fld; spr.; fls. 8″ wide; begonia (619) shading to scarlet bands on each side of upper segs; lower segs begonia with white mid-stripe.

Amaryllis clone **'Catherine Valente'**; reg. A-688-D5B, 7-8-62; 23″ high; umbel 3—4-fld; spr.; fls. 7″ wide; frosted delft rose (020/1) with markings of geranium lake (20) toward the throat in upper segs.

Amaryllis clone **'Orange Favorite'**; reg. A-689-D5A, 7-8-62; 15″ high; umbel 3—4-fld; spr.; fls. 6½″ wide; polychrome, Indian orange (713) with glowing red throat.

Amaryllis clone **'Orange Wonder'**; reg. A690-D5A, 7-8-62; 20″ high; umbel 3—4fld; spr.; fls. 7″ wide; Indian orange (713) blending to glowing capsicum (715).

Amaryllis clone **'Television'**; reg. A-691-D5A, 7-8-62; 17″-20″ high; umbel 4—5-fld; spr.; fls. 6½″ wide; French rose (520) blended with white to give a frosted effect; upper segs marked with porcelain rose (620) on each side of midstripe.

Amaryllis clone **'Rotterdam'**; reg. A-692-D5A, 7-8-62; 20″ high; umbel 4-fld; spr.; fls. 7″-8″ wide; currant red (822/2), deepening to (821) in throat; round form, slightly bearded in throat.

Amaryllis clone **'Brilliant Star'**; reg. A-708-D5A, 7-8-62; 20″ high; umbel 4-fld; spr.; fls. 6″ wide; currant red (821) self, deepening in the throat.

Amaryllis clone **'Dutch Master'**; reg. A-709-D5A; 22″ high; umbel 3—4-fld; spr.; fls. 7½″ wide, blending of rose Bengal with white base, midrib and edges white.

Amaryllis clone **'Extase'**; reg. A-710-D5A, 7-8-62; 36″ high; umbel 3—4-fld; fls. 9″ wide; orange red with fine white margins on each seg.

Amaryllis clone **'Florien'**; reg. A-711-D5A, 7-8-62; 24″ high; umbel 4-fld.; spr.; fls. 8″ wide, a blend of white and rose madder (23), white band in center of segs.

Amaryllis clone **'Floriade'**; reg. A-712-D5A, 7-8-62; 24″ high; umbel 4-fld., fls. 9″ wide, a soft blend of white and rose pink (427).

Amaryllis clone **'Little Diamond'**; reg. A-714-D5A; 7-8-62; 18″ high; umbel 4-fld.; spr.; fls. 8″ wide; dawn pink (523) with white midrib in each seg; round, flat flower.

Amaryllis clone **'Mount Everest'**; reg. A-715-D5A; 7-8-62; 22″ high; umbel 3—4-fld.; spr.; fls. 8½″ wide; orient pink (416) and China rose (024).

Amaryllis clone **'Pink Beauty'**; reg. A-719-D5A, 7-8-62; 20″ high; umbel 3—4-fld.; fls. 7″ wide, rose pink (427) blending with white on upper 3 segs; lower segs white with tinge of orient pink (416/3).

Registered by Robt. D. Goedert, Jacksonville, Fla., for W. Warmenhoven & Zonen:

Amaryllis clone **'Irene'**; reg. A-713-D5A, 7-8-62; 18″ high; umbel 4-fld.; fls. 8″ wide; Salmon pink (619) with lighter seg margins; round flower.

Amaryllis clone **'Orange Nassau'**; reg. A-716-D5A; 18″ high; umbel 3—4-fld.; spr.; fls. 7″ wide, burnt orange (01), gold dusted in strong light; a beautiful combination.

Amaryllis clone **'Madame Curie'**; reg. A-717-D5A, 7-8-62; 14″ high; umbel 3—4-fld.; spr.; fls. 6″ wide, shrimp pink (616), self, deeper veins, and throat.

Amaryllis clone **'Mount Blanc'**; reg. A-718-D5A, 7-8-62; 18″ high; umbel 3—4-fld; spr.; fls. 6″ wide; pure white, segs ruffled; greenish throat.

Registered by Frederick B. Schmitz, Port Sulphur, Louisiana:

Amaryllis clone **'Flame'**; reg. A-693-D7; 4-10-62; 20″-21″ high; umbel 4-fld.; fls. 6″ wide, vermilion (18) self.

Amaryllis clone **'Neel'**; reg. A-694-D5A, 4-10-62; 18″-20″ high; umbel 4-fld.; spr.; fls. 7″ wide; orient red (819) delf, with greenish throat.

Amaryllis clone **'Kaye'**; reg A-695-D5A, 4-10-62; 21″-22″ high; umbel 3fld.; spr.; fls. 6½″ wide, jasper red (018) with faint white streak in center of segs; light greenish throat.

Amaryllis clone **'Grace'**; reg. A-696-D5A, 4-10-62; 18″-19″ high; umbel 3-fld.; spr.; fls. 6″ wide, white edged with orient red (819/1).

Amaryllis clone **'Miss Annie'**; reg. A-697-D4A, 4-10-62; 18″ high; umbel 4-fld; spr.; fls. 6″ wide; currant red (821).

Registered by W. J. Perrin, 4753 Press Dr., New Orleans, Louisiana:

Amaryllis clone **'Grand Bay'**; reg. A-698-D5A, 5-6-62; 15″-18″ high; umbel 4-fld.; spr.; fls. 6″ wide; geranium lake (20/1), white midrib, all segs minutely dotted reddish.

Registered by Mrs. H. E. Dorr, 33 Oaklawn Dr., Metairie, Louisiana:

Amaryllis clone **'Scotty's White'**; reg. A-699-D5A, 5-6-62; 16″-18″ high; umbel 4-fld.; spr.; fls. 6″ wide; white with greenish tint; back of segs with green midrib.

Amaryllis clone **'Otto Felix'**; reg. A-700-D5B, 5-6-62; 23″ high; umbel 4-fld.; spr.; fls. 6½″ wide; very fragrant, greenish to white throat, with Delft rose outer half of segs.

Amaryllis clone **'Gemato'**; reg. A-701-D5B, 5-6-62; 15" high; umbel **4-fld.**; spr.; fls. 5½" wide, lively blood red (820) almost to throat, white rim around all segs; very fragrant.

Registered by G. C. Van Meeuwen & Sons, Heemstede, Holland:

Amaryllis clone **'Hong Kong'**; reg. A-720-D5A, 7-8-62; 22" high; umbel **4-fld.**, fls. 8" wide, blood red (820) with currant red (821) throat; flower round, throat slightly bearded.

Amaryllis clone **'Mars'**; reg. A-721-D5A; 7-8-62; 28" high; umbel 4—5-fld.; spr.; fls. 8" wide, currant red (821), very dark throat.

Amaryllis clone **'Osiris'**; reg. A-722-D5A, 7-8-62; 24" high; umbel **4-fld.**; spr.; fls. 8½" wide, orient red (819) with a blood red (820) throat.

Amaryllis clone **'Rilona'**; reg. A-723-D5A, 7-8-62; 24" high; umbel 4-fld.; spr.; fls. 9" wide, light salmon (412), slightly darker throat.

Amaryllis clone **'Rose Marie'**; reg. A-724-D5A, 7-8-62; 24" high, umbel 4—5-fld.; spr.; fls. 8" wide; dominating color is carmine rose (621), light mid-rib; lower segs whitish, blending with greenish throat.

Registered by Robt. D. Goedert, Jacksonville, Fla. for Harry de Leeuw Co. So. Afr.:

Amaryllis clone **'Orangedale'**; reg. A-728-D5A, 7-8-62; 19" high; umbel 4-fld.; spr.; fls. 6½" wide; capsicum red (715), slightly deeper throat.

Amaryllis clone **'Rosaline'**; reg. A-729-D5A, 7-8-62; 19½" high; umbel 2-fld.; spr.; fls. 7½" wide; mottled magenta rose.

Amaryllis clone **'Ruby Glow'**; reg. A-730-D5A, 7-8-62; 19" high; umbel 4-fld.; spr.; fls. 6" wide, geranium lake (20), slightly darker in throat.

Amaryllis clone **'Tangerine'**; reg. A-731-D5A, 7-8-62; 8½"; umbel 4-fld.; spr.; fls. 5" wide, Delft rose (020), very clear and striking in appearance.

Amaryllis clone **'Terra Cotta'**; reg. A-732-D5A, 7-8-62; 8" high; umbel 4-fld.; spr.; fls. 6" wide, vermilion (18), blending into rich claret rose (21) in throat.

Registered by Robt. D. Goedert, Jacksonville, Fla., for C. Warmenhoven:

Applications received too late for inclusion of descriptions which will appear in the "Catalog of Hybrid Amaryllis Clones" in the 1964 Year Book. **Amaryllis** clone **'Apollo'** (CW, 1962), reg. A-725, orange red; **'Flamboyant'** (CW, 1962), reg. A-726, scarlet red; and **'Topscore'** (CW, 1962), reg. A-727.

Registered by M. Van Waveren, Hillegom, Holland:

Applications received too late for inclusion of descriptions which will appear in the "Catalog of Hybrid Amaryllis Clones" in the 1964 Year Book: **'Danny Kaye'** (VW, 1962), reg. A-733, scarlet red; **'David Hollestelle'** (VW, 1962), reg. A-734; orange scarlet; **'Independence'** (VW, 1962), reg. A-725, orange, **'Madam Van Waveren'** (VW, 1962), reg. A-736, striped white; **'Pola Negri'** (VW, 1962), reg. A-737, very dark red; **'Polar Light'** (VW, 1962), reg. A-738, dazzling white; **'Scarlet Globe'** (VW, 1962), reg. A-739, scarlet; and **'Telstar'** (VW, 1962), reg. A-740, rose.

Registered by G. C. Van Meeuwen & Sons, Heemstede, Holland:

Applications received too late for inclusion of descriptions which will appear in the "Catalog of Hybrid Amaryllis Clones" in the 1964 Year Book: **'Albaron'** (VM, 1962), reg. A-741; **'Amor'** (VM, 1962), reg. A-742; **'Aphrodite'** (VM, 1962), reg. A-743; **'Minerva'** (VM, 1962), reg. A-744; **'Pallas'** (VM, 1962), reg. A-745; and **'Thalia'** (VM, 1962), reg. A-746.

HYBRID NERINE CLONES

The following additions (not registered) to the "Catalog of Nerine Cultivars" have been sent in by Emma D. Menninger, Greenoaks, 730 North Old Ranch Road, Arcadia, Calif. (See PLANT LIFE 18: 43. 1962, for additions up to 1962.)

Name	Grower/supplier	Description, etc.
'Ancilla'	Va/Va	Carmine red (HCC-623) lowest seg lighter.
'Bettina'	Va/Va	Neyron rose (HCC-623), darker nerved.
'Nereus'	deG/deG	Outside, fuchsine pink (HCC-627/2), inside (627/3).
'Rosy Queen'	deG/deG	Neyron rose (623) to center, lighter striped.
'Pontos'	deG/deG	Mutation from 'Rosy Queen', dark Neyron rose (623), lighter center, segs ruffled.
'Record'	vV/vV*	Clone of **Nerine bowdenii**; phlox pink (625/1).
'Fenwick'	?	A clone of **Nerine bowdenii**; see Gard. Chron. Dec. 8, 1962, p. 405.

* Additional abbreviation: vV—G. J. van Velsen, Haemskerk, Holland.

[**PLANT LIFE LIBRARY**, continued from page 62.]

MUSHROOMS AND TRUFFLES, by Rolf Singer. John Wiley & Sons, 440 Park Av. So., New York 16, N. Y. 1962. Pp. 272. Illus. $10.25. This book by an outstanding authority provides a reliable, readable text on the cultivated mushrooms and truffles. This is particularly important since these are now being grown on the basis of new scientific principles, and the methods of control are being improved. After a stimulating preface, the author provides a brief general introduction to the botany of mushrooms, and chapters on the botany and culture of the important kinds, including a potentially wider range of species; weeds and weed fungi; diseases and pests; mushrooms as food, and other uses. This important text is highly recommended to all interested in this subject.

NEW METHODS OF CELL PHYSIOLOGY, by O. H. Warburg et al. John Wiley & Sons (Interscience Div.), 440 Park Av. So., New York 16, N. Y. Pp. 644. Illus. $35.00. This outstanding volume contains 95 papers on new methods of cell physiology as applied to research in cancer, photosynthesis, and mechanism of x-ray action in the laboratory of Dr. Warburg from 1945 to 1961. There is a brief biography of Dr. Warburg, with portrait, by Dean Burk. This is followed by papers concerned with the medical problem of the origin of cancer cells, and the general biological problem of the conversion of light energy into chemical energy in green cells. The purpose of the publication of the methods at this time is to hasten the use of the new methods in cell physiology so as to enlist the collaboration of researchers generally in the solution of the problems already indicated. This book represents a landmark, and is recommended without reservations to all who are interested in these fields of research.

INTRODUCTION TO IMMUNOCHEMICAL SPECIFICITY, by W. C. Boyd. John Wiley & Sons, 440 Park Av. So., New York 16, N. Y. 1962. Pp. 158. Illus. $8.00. This book was written to serve as an introduction to immunochemical specificity for the non-specialist, and specialist. It incorporates earlier work which has served as a foundation for recent advances. The chapters are devoted to antibodies I and II, antigens, blood groups, plant agglutinins (lectins) I and II, blood group antigens, salmonella antigens, union of antibody with antigens, and energy of antibody-antigen reactions. This stimulating text is highly recommended to the specialist and also the non-specialist.

[**PLANT LIFE LIBRARY**, continued on page 146.]

3. GENETICS AND BREEDING

LYCORIS HYBRIDS PROVE REWARDING

SAM CALDWELL, *Tennessee*

My first attempts to cross-breed some of the several *Lycoris* species in my plantings began in 1953. A few apparently sound seeds were gathered and planted. Then in 1954 and 1955 there were opportunities to cross pollinate the *L. sprengeri* and fertile strain *L. radiata* flowers that were appearing at the same time in late summer. The crosses seemed to "take" readily both ways, and more than 100 seedling bulbs eventually resulted.

In succeeding years I tried other crosses, some failing and some producing a few to many seeds. These efforts toward *Lycoris* hybridizing were reported in the 1958 HERBERTIA and at greater length in *Bulletin No. 5* (March 1960) of the *Louisiana Society for Horticultural Research*. It was frustrating, however, to be writing about *Lycoris* hybrids when I was not at all sure that I had any. Years passed and there were no flowers to prove that actual crosses of different species had been achieved.

Thus it was a thrill in August of 1961 to find a bud pushing up in my lycoris "nursery" bed in a row labeled "*L. sprengeri* x *L. radiata*, 1955." The flowers on the scape reached peak development on August 17. Happily, two others came along into bloom later in the month—one more in the 1955 lot of seedlings and one from the same cross made in 1954.

These results were definitely worth waiting for. Not only are they beautiful flowers; they are utterly different from anything presently available in lycoris. It was a joy to find so much variation in the three scapes that appeared, from the rich dark purple-red, rather narrow segments of flowers on "Sprenrad 1" to the broader segments and lighter purplish pink coloring in "Sprenrad 3." "Sprenrad 2," is practically identical in form with No. 3 but has coloring nearly as dark as No. 1. There are still some 30-odd bulbs of this cross to bloom and well over 50 of the reverse (*L. radiata* x *L. sprengeri*) cross; so the coming years should provide plenty of excitement.

It will take years of testing to determine the adaptability to garden cultivation of these hybrids. The seed parent, *L. sprengeri*, is quite hardy outdoors in New York state, producing its foliage in spring after the coldest of winter weather is past. Unfortunately, all the "Sprenrad" hybrids seem to have inherited the fall-foliage habit from *L. radiata*. Probably they will be safe wherever that species can be grown, but they may not thrive farther north, because their fall and winter leaves will be subject to cold damage. Their leaves, incidentally, are easily distinguished from *L. radiata* foliage by a more bluish green color and less prominent mid-rib veins.

The "Sprenrad" name and numbers for the seedlings are being used for convenience at present. In time some of them will likely get clonal designations.

The appearance of these flowers furnished inspiration for a renewal of my hybridizing efforts. I should like to urge other amaryllid enthusiasts to join in this rewarding activity. It seems incredible that here we have a genus of fine garden flowers in which almost no breeding has been done. True, it is slow work but probably no slower than daffodil breeding, especially for gardeners who live in the Lower South, where most lycoris grow faster than they do in colder climates. By getting my seedlings out of their starting pots and into ground growing beds faster, I hope to speed up flowering of my own hybrids.

From my own experience I would judge that all of the lycoris which normally set seed to their own pollen will cross with other fertile types. And this is not the end; all three of my new "Sprenrad" blooms set good seed when self pollinated and also crossed back on both their parents and on *L. haywardii.* Failures come when I try to work with *L. squamigera, L. incarnata, L. caldwellii, L. houdyshelii, L. elsiae* and the common form of *L. radiata*, none of which have ever set seed in my garden. Using pollen from these seemingly sterile lycoris on fertile species I have gotten occasional questionable "takes" resulting in just one or two seeds. I fear that these may be due to parthenogenesis or to accidental selfing of the flowers but of course am growing the seedlings along in the hope that they are hybrids.

Following is a complete list of apparently successful crosses I have made, including those of the 1961 season:

L. haywardii X **L. sanguinea** and the reverse
L. haywardii X L. "sperryi" and the reverse
L. haywardii X L. "Sprenrad"
L. radiata X **L. haywardii**
L. radiata X L. "Sprenrad"
L. radiata X **L. traubii**
L. radiata X **L. sprengeri** and the reverse
L. radiata X L. "sperryi"
L. sanguinea X L. "sperryi" and the reverse
L. sprengeri X **L. haywardii**
L. sprengeri X L. "sperryi"
L. sprengeri X **L.** "Sprenrad"

The *L.* "sperryi" mentioned is an unidentified but very fine hardy golden flowered lycoris collected in hills near Huchow, China in 1925 and brought to Nashville, Tennessee by the mother of a Methodist missionary then serving in Huchow.

Some of the crosses listed were made possible by the cooperation of Mr. B. Y. Morrison, Pass Christian, Mississippi, whose lycoris bloom several weeks earlier than mine. Through the flowering season he air-mailed fresh pollen of various species for use on my flowering scapes as opportunity offered.

For those interested in *Lycoris* hybridizing, the very simple methods used for making crosses and growing seedlings are covered in the two published reports mentioned at the beginning of this article. Certainly all the crosses I have made should be repeated many times and other combinations should be tried. By saving pollen of some of the earlier flowering species, growers in the Lower South may be able to crossbreed the St. Augustine type *L. aurea*, and the hardier *L. traubii* should make an even better seed parent.

LYCORIS NOTES, 1962

T. H. JACOWAY

For several years I have been of the opinion that the genus Lycoris held considerable promise in the cut flower market. Ever since a friend in Hastings, Florida gave me 18 *L. aurea* bulbs in 1956, the flowers have had a special appeal. Here in Palatka they have been virtually unknown. This is only 28 miles from St. Augustine, long the "home" of this beautiful amaryllid—at least in Florida. Mrs. MacArthur reported, in Volume I of Herbertia, that the Oldest City has more of these bulbs than any other section of the state. This is no doubt a true statement even at the present time. In September and October the lovely golden flowers are a compelling sight all over St. Augustine. Mr. John R. Heist, who sold *L. aurea* bulbs by the hundreds many years ago, has probably the largest individual planting in that city, numbering about 1500 bulbs. He is no longer in the commercial field and is growing them strictly for enjoyment.

In the summer of 1959 I purchased 400 bulbs from a California dealer, who imported them from Japan, and advertised them as *L. aurea*. They have done well and bloomed each year since. The flowers are all yellow, but look vaguely "different". They bloom several weeks earlier than the local species. The foliage is distinctly not *L. aurea* and there seem to be at least three species or varieties, if foliage appearance alone is considered. The literature states that recent importations from Japan is the species *L. traubii*. Some of mine may indeed be *L. traubii*, but possibly there are other species also. I was able to get several dozen seed from this planting in 1959 by selfing, and these seedlings are vigorous at the present time, but still rather small.

Following up the cut flower idea, I entered into partnership with Junius Bolin, of Welaka, Florida. We started buying *L. aurea* bulbs around St. Augustine and Hastings in the early summer of 1960 and were successful in securing about 300. They flowered that fall and we gave away our entire production of flowers to churches and friends in order to stimulate interest locally.

In the early summer of 1961, I started purchasing again in the same locale. Most homeowners, I discovered, would willingly part with at least some of their stock. In this manner we accumulated another 2,000 or more bulbs.

In the process of making these door-to-door purchases, it occurred to me that it might be of interest to find out something about the soil conditions under which they were growing in each instance. The idea being that we could then grow them better in the new location if we knew what they liked and were accustomed to. Accordingly, I took soil samples in most locations. Being employed as a fertilizer salesman, I had access to our company-operated, modern, and well staffed laboratory for analysis. The results were more or less uniform, showing a pH range of 6.3 to 7.7. The calcium (expressed in pounds per acre—six inches deep) ran from 1385 to 2000. These were all in St. Augustine.

The lone Hastings location showed a pH value of 5.5 and a calcium reading of 670. Around St. Augustine it is common to find considerable shell mixed with the soil, while in Hastings there is none. There was no distinct difference in the size and general appearance of the bulbs in any instance.

In both years our purchases were made as soon as the foliage had yellowed and died, usually in May and June. We replanted in our Welaka location after liming to bring the pH up to about 6.5. We were surprised to discover that the bulbs were able to form new roots, up to three inches long, after being replanted for as short a time as two weeks.

With the view in mind that there might also be a demand for the red species, *L. radiata,* we bought 1000 bulbs from W. J. Leseman near Green Cove Springs, Florida. As reported by Wyndham Hayward in the 1959 issue of Herbertia, Mr. Leseman has this species growing by the thousands. Our volume of this flower was so small in 1961 as to make it not worthwhile commercially.

In September of 1961 we made our first commercial shipment of *L. aurea* flowers to a New York wholesale florist. To this day we don't know what happened to them, although we know that they were received. That dampened our spirits somewhat, in regard to long distance shipping, and we started selling the cut flowers to local retail florists. They were very well received, and the demand exceeded our small supply.

Plans are for continued effort in the cut flower field with Lycoris species. This will be primarily *L. aurea, L. traubii,* and *L. radiata.* Other species which may offer possibilities, but which we have in very limited supply, are *L. sanguinea, L. sprengeri, L. caldwellii,* and a cream which was bought as *L. albiflora.* This entire genus, in our opinion, is an extremely interesting one and deserving of wider attention.

LYCORIS HYBRIDS MADE IN JAPAN

EI-ICHI TAKEMURA, *Tokyo University of Education, Otsura, Tokyo, Japan*

F-1 HYBRID BETWEEN **LYCORIS SPRENGERI** & **STRAMINEA**

[The following summary is taken from an article published by Dr. Takemura in The Botanical Magazine, Tokyo, Vol. 74. pp. 524-531. 1961.—*Editor*]

SUMMARY

1. Morphological and cytological studies were carried out on the F-1 plants raised from the cross, *Lycoris sprengeri* Comes (2n=22=22R*) x *L. straminea* Lindl. (2n=16=6V** + 10R.)

2. The outer appearance of the F-1 hybrid was found to be intermediate between both parent plants, while it resembled more or less closely the pollen parent. *L. straminea.*

3. The chromosome number in somatic cells of the F-1 plant was

19=3V+16R, i.e., the sum of the numbers in gametic cells of both parents.

4. At the 1st metaphase in microsporogenesis of the F-1 plants, 3 heteromorphic triplets and 5 bivalents have been commonly observed.

5. The F-1 plants were shown to be completely sterile in all selfing experiments.

6. From the number, shape and behavior of the chromosomes in meiotic division, it is suggested that this artificial hybrid seems to be a diploid form of *L. squamigera* Maxim.

7. The synoptic behavior between V-shaped and rod-shaped chromosomes in this hybrid seems to support Inariyama's view that in the genus *Lycoris* one V-shaped chromosome is equivalent to two rod-shaped ones, and, therefore, the former might have been derived by the fusion of the latter two.

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* R signifies rod-shaped chromosomes.
** V signifies V-shaped chromosomes.

HYBRIDS BETWEEN **LYCORIS** SPECIES

[The following summary is taken from an article published by Dr. Takemura in The Botanical Magazine, Tokyo, Vol. 75: 72—79. 1962.—*Editor*]

SUMMARY

1. Morphological and cytological studies were made on the interspecific hybrids raised from the following crosses:

Lycoris sprengeri Comes (2n=22=22R) x *Lycoris radiata* Herb. var. *pumila* Hort. [= *Lycoris radiata*—type.—*Ed.*]—Hybrid (1)

Lycoris sanguinea Maxim. (2n=22=22R) x *Lycoris radiata* Herb. var. *pumila* Hort. [= *Lycoris radiata*—type.—*Ed.*]—Hybrid (2)

Lycoris sprengeri Comes (2n=22=22R) x *Lycoris sanguinea* Maxim. (2n=22=22R)—Hybrid (3)

2. The outer appearance of these hybrids was intermediate between both parent plants, and Hybrid (1) resembled rather closely the mother plant, *L. sprengeri.*

3. The chromosome number in somatic cells of these hybrids was found as 22=R, i.e., the sum of the numbers in gametic cells of both parents.

4. These hybrid plants were all shown to be fertile in selfing experiments.

5. In Hybrid (3), the color of the perigone is expressed by two anthocyanins, i.e., cyanidin and pelargonidin derivatives. These pigments are identical with those contained in both parents, *L. sprengeri* (cyanidin) and *L. sanguinea* (pelargonidin), respectively. Therefore, the general concept that cyanidin is dominant over pelargonidin does not hold in this hybridization.

BREEDING AMARYLLIDS IN NORTH GEORGIA

BECKWITH D. SMITH, *3479 Rockhaven Circle, N. E., Atlanta 5, Georgia*

Our hybrid Amaryllis bulbs, which were transported from Jacksonville, Florida in the fall of 1960 have apparently become acclimatized to the Atlanta temperatures, and this spring (1962) began showing buds in the outdoor planting about May 15th, and bloomed until the end of June. Flower scapes were exceptionally long, and blossoms large, typical of the Ludwig and other Dutch strains from which they were originated. One peculiarity, however, was that the bulbs "threw" a majority of two blooms as a rule, instead of the usual normal four blooms on smaller scapes when they were grown in North Florida. At

Fig. 15. Hybrid Amaryllis originated by Beckwith D. Smith, Atlanta, Georgia. Seedlings grown outdoors; and lower left, 8-seged hybrid. All flowered June 1962. Photos by the originator.

first I thought that there may have been something to cause this manner of blooming in the heavy mulching required to protect the bulbs from freezing, as they were first covered with dairy fertilizer, with an additional top dressing of well rotted sawdust, thus being more deeply settled in the clay planting soil. But I am told that this has nothing to do with the 2-flowered scapes—buds are set a year or more in advance during the summer growth period and develop slowly in the bulb and then emerge a year or more later.

In Florida, we had to combat the large, multi-colored "Lubber" grasshoppers. In our planting here, we have a large striped snail, as well as the common black slug to fight, which attack the Amaryllis

buds at ground level, as well as the leaves when they appear. However, copious applications of Snarol pellets keep them under control when they appear in the garden.

We have taken numerous black and white photographs of the Amaryllis in flower this spring, which show the abundant growth of foliage, scapes and flowers in an area of our garden which is ringed with tall pine trees (see Figs. 15 and 16).

Fig. 16. Hybrid Amaryllis originated by Beckwith D. Smith, Atlanta, Georgia. Upper left, tangerine colored with white ribs; upper right, bi-color, rose and white; lower left, *Amaryllis* x *johnsonii* x *A. psittacina* hybrid, metallic red; lower right, peach-colored. All flowered April to June, 1962. Photos by the originator.

Mention has been made in a previous article submitted for Herbertia of trials which we have been running in the greenhouse of hybrid Amaryllis originated by Mrs. J. S. Barry, of Route 1, Box 7, Prairieville, Louisiana. Mrs. Barry has with meticulous and loving care developed some remarkably beautiful flowers from bulbs of her own crossing, using named clones, species and seedling cultivars. Our trial bulbs were received from Prairieville in the fall of 1961, most with roots intact, and were held for a period of time in cool dry storage and then

potted up and benched in the heated greenhouse. Since heat was held to a minimum of between forty-five and fifty degrees during night hours, and cut very low during daytime sunlight hours, the purpose being to establish root growth, the bulbs began to show activity around the middle of February. Then, on April 2nd, the first bulb bloomed, and thereafter in succession so that we had blooms continuously until the last bud opened in the greenhouse on April 26th. The following is the order of bloom from the most outstanding crosses of Mrs. Barry's hybrids:

(1) *A. striata* X 'Maria Goretti', 2 flowers, Orient Red, with small stripe in throat. (2) *A. striata* X 'Maria Goretti'. 3 flowers, Rose, with small stripe in throat. (3) 'Candy Cane' X 'Silver Lining'. 4 flowers, bright Red, bearded, and with green throat. (4) White Seedling X 'White Giant'. 4 flowers, brilliant White with green throat. (5) 'Ludwig's 'It' X 'Brilliant'. 4 flowers, lovely Rose. (6) *A. striata* X 'Maria Goretti'. 4 flowers, good Red, with green throat. (7) Van Meeuwen red and white Seedling X 'Five Star General'. 4 flowers, Oxblood Red. (8) White Howard and Smith Seedling X 'Maria Goretti'. 4 flowers, gleaming White, with stitched Pink picotee edging. Fragrant! (9) *A. johnsonii* X 'Ludwig's Goliath,' 4 flowers, Salmon Red miniature. Second scape two flowers. (10) 'Ludwig's Goliath' X 'Caruso'. 4 flowers, Orange Red. (11) 'Maria Goretti' X 'White Giant'. 4 flowers. clean White with green throat. Fragrant! (12) 'Salmon Joy' X 'Bouquet'. 4 flowers, Rose Pink. (13) 'Caruso' X 'Champion's Reward'. 4 flowers, Orange Red. (14) White Seedling X 'White Giant'. 4 flowers, clear White with green throat. (15) 'Margaret Truman' X 'Pink Favorite'. 4 flowers, a large, gorgeous shell Pink. (16) 'Ludwig's 'It' X 'American Express'. 4 flowers, large, attractive Red, with darker Red in throat. (17) *A. johnsonii* X 'Ludwig's Goliath'. 4 flowers, dark Red, small stripe in throat.

It can be seen from the above that Mrs. Barry has carefully selected some of the best seed and pollen parents, and the results obtained were most successful in the writer's opinion, to say the least. Others of her hybrids were also tested, but are not covered here because they did not bloom during the time of testing. Individuals who are interested in obtaining bulbs of the above crosses should communicate with Mrs. Barry direct. Hybridizers and collectors of Amaryllis will find much in her wide variety of hybrids for the improvement and development of their own clones.

We have now been in Georgia for two years, and during this time have made numerous appearances before Atlanta garden clubs, extolling the pleasant virtues of growing more beautiful *Amaryllis*. We have shown our colored slides to all who care to see them, giving cultural information and tips on growing from our own experience, and hope that in some measure have brought more interest to the cause of growing and enjoying them. While North Georgia is quite cold in winter, adequate mulching will protect bulbs outside, as we have found from two seasons. We are constantly urging that all Georgians and Amaryl-

lidarians everywhere become interested in better growing, hybridizing and understanding of these "beautiful ladies" of the flower garden, for here is the soul and essence of nature.

WHY NOT AMARYLLIS THE YEAR 'ROUND?

V. Roger Fesmire, *1170 South Xavier St., Denver 19, Colorado*

When I moved my family from Pennsylvania to Colorado many years ago, I brought with me close to a hundred Amaryllis bulbs of various sizes which had been grown in Pennsylvania by being planted in the garden in summer and stored dry over winter. However, this type of culture was not successful in Colorado, probably because of the shorter growing season, and most of the bulbs were finally lost with the exception of a red Dutch hybrid and some bulbs purchased from Mr. Houdyshel under the label of "Rutila hybrids".

When a small greenhouse was secured several years ago, I promptly returned to growing Amaryllis, and in the greenhouse their performance has surpassed all expectations. Kept in the greenhouse all year around, grown in pots and well fertilized, and with partial shading from the brilliant sunshine, the bulbs make luxuriant growth. The temperature ranges in summer from about 60 degrees to 90 degrees, and in winter from about 55 degrees to 75 degrees. The bulbs are rested in the fall by decreasing the amount of water given. This past season, flower buds began to appear in December, and there were Amaryllis in bloom from January 1 to about May 1, 1962, the majority of the bulbs sending up two or three flower scapes. These bulbs included Dutch, Indian, Japanese, and American hybrids, my original Striata (Rutila) hybrids, and what is apparently a form of Amaryllis Belladonna. Acquired too late to bloom were some South African and Howard and Smith hybrids.

From comments in the Amaryllis Year Books, it is evident that those who raise Amaryllis in large numbers enjoy some flowers all through the year. This is not possible of course with only a small greenhouse, although it would be very desirable. Therefore, I have embarked upon a three-point program designed to achieve the same results in other ways than mere quantity.

First, by planned management it should be possible to spread out considerably the blooming period of whatever bulbs one may possess, enlarging upon the suggestions of Luyten in Volume 12 of Herbertia. Accordingly, this coming fall of 1962 those bulbs which were the first to send up new growth last winter will be dried off several months in advance of the bulk of my bulbs, in the hope that they will come into bloom several months sooner than the others. Another phase of this experiment will be to keep some bulbs at a lower temperature during the winter months, which may delay their blooming somewhat, perhaps until early summer.

In the fall of 1961, an experiment was performed with three bulbs which were offsets of one original Striate hybrid. One bulb was dried off completely, one watered every other week, and one not rested at

all. Although the bulb which was completely dried off bloomed only two weeks sooner than the bulb which was not rested at all, the new foliage of this bulb was fully developed by May, at which time new growth was just beginning with the bulb that had not been rested. Hence it appears probable that one of these bulbs can be brought into bloom again several months before the other one. In time it may be possible to have these Striata hybrids in bloom all through the year, particularly since I have a number of these bulbs.

Second, by breeding of species or hybrids which have a tendency to bloom more than once in a year, it may be possible to develop strains which will be recurrent bloomers. Such hybrids will probably be evergreen as to foliage, and with flowers in the small to medium size range, which would make them quite desirable for the small greenhouse and the home. If the foliage could also be reduced in size, the plants would be ideal in a small greenhouse. At present I have three Amaryllis which display a tendency to recurrent blooming: the Striata hybrids, a form of Amaryllis Belladonna, and a hybrid from India which this year sent up new foliage and a flower stalk both in January and again in June. Therefore, my breeding program so far has primarily been along this line, and has involved crosses between these three Amaryllis and other hybrids which I possess, although it would be very desirable to acquire more breeding stock of this type. Since this program was only developed about one year ago, no seedlings have as yet come into bloom, but they are growing vigorously.

Third, by breeding present hybrids with species which bloom naturally in the summer, or fall, or winter seasons, hybrid strains should be produced which will bloom naturally at these various seasons. Here of course the primary difficulty is the fact that very few such species are available.

This three-point program has opened up entirely new avenues of interest and enjoyment for me. Perhaps worthwhile results may be obtained eventually, and I look forward with keen anticipation to the future. All suggestions will be most welcome.

BREEDING BRUNSVIGIAS AND X CRINODONNAS

MRS. KENNETH B. ANDERSON, *California*

September is a wonderful month for those who love the fall blooming amaryllids. Even tho the most of them bloom entirely without foliage, they are very bright, pert and cheerful on these very hot days when nearly everything else is wilting.

Brunsvigias come up in the driest of places, having had no watering whatever since spring. I can't help but wonder what triggers the growth mechanism, what set of circumstances cause it to know that it is time to bloom! It certainly isn't a change in temperature or in length of day or in earth moisture, yet they unfailingly push up their buds at the same time each year—the common cape belladonna first in mid August, follwed shortly by all the hybrids and lastly the Bruns-

vigia Rosea minor which finishes the season. Incidentally those Brunsvigias which happen to be planted in beds which are watered all summer, have the same time schedule, and seem to bloom the same as those that have remained dry all summer.

I've had a few more variations this summer among the new seedlings, but it is probably going to take years of breeding to get much more variation than there already is. We now have pure whites thru pink, rose, cerise, raspberry and coppery tones. We have pattern variations and pure self colors in all these shades. We have whites with yellow throats, with green throats and apricot throats, whites with picotee edges of pink or red, whites with wide rims of pink or red, whites with delicately pencilled rose or red markings on the tips and whites with brilliant fingernail polished tips. The color on many of these flowers, as they age, suffuses into the white and becomes a deep rosy color thruout, while others keep the original pattern almost till they wither. There are pink flowers with candy stripes of red down the rib or with just a blotch of the red near the tip and then there are deep rose flowers and deep raspberry flowers with throats suffused with apricot or copper color which also shows thru on the outside of the flower.

Shapes vary from thin spidery segmented ones, to wide rounded overlapping petalled ones, from trumpet shapes to flat open faces and chalice cups. There are formal, crisp, pointed petals or relaxed looking twisted ones, gently waved ones and very ruffly ones, reflexed tips and non-reflexed ones.

Sizes vary too; we have a whole race of small dainty flowers on slim stems and we have giants, chest high with large and sometimes gross flowers, and many sizes in between.

The number of flowers in each head varies too, some have as few as 4 or as many as 28. Those with fewer flowers generally face in one quarter of the circle toward the Southwest, while most of the whites and many of the multifloras open in a full circle with flowers facing all 380°. They certainly love the sun, those under trees or bushes bend so far to the South that they're finally lying on the ground, but with heads up reaching for light.

The weather certainly does affect them. In changeable weather I find I have to change the description on the labels frequently. On several dull days in a row I labeled some newly opened flowers "white with crimson tips, throat remains white on aging" or "small dainty white with pink pencilled edge." Suddenly out comes the sun and 90° heat and the first one changes to "white with rose edge becoming all rose on third day" and second one with its small dainty white flowers all of a sudden produces in its umbell a giant pink blossom looking ludicrous in amongst its tiny sisters. No wonder one of the bulbs Les Hannibal gave me is labelled "Variable".

About mid September the Crinodonnas (crosses between Crinum and Brunsvigias) come into flower. These are particularly lovely because they have their deep green, neat clumps of foliage to set them off.

The majority of these from my first cross of Crinum Moorei (pink form) on Brunsvigia Rosea minor, are in the soft shades of pink and rose, and two quite deep raspberry colored ones. These flowers do not have much variation in pattern as the Brunsvigias do. My other cross, Crinum Moorei. (light form) on the white Brunsvigia x Parkeri (multiflora alba) is giving lighter flowers; one pure white, one white with narrow picotee edge of pink, others in shades of light pink.

The white one, 30″ high, has 10 flowers (+ 7 aborted ones) large trumpet shape, petals slightly twisted but fairly open faced nonetheless.

Another, white with picotee edge, has 8 flowers (+ 7 aborted) has a pink bud, opens with the narrow rose picotee edge and brilliant rose tipped pistil. If the day is sunny all color fades to pure white except the pistil tip.

Another white opens with very deep carmine tips, fairly wide petals and the red fades into the white as it ages and becomes a wholly rose colored flower.

The deep colored Crinodonnas tend to have more flowers, I've counted up to 28 buds. Two of these have flowers which open up very nicely into an open faced trumpet shape. One of these I consider my best result in breeding so far; 48 inches tall and of a color close to that of Ellen Bosanquet.

It is strange that some seedlings never have bloomed. Those which have bloomed took only 4 or 5 years from seed. I expected the rest to bloom within the next few years, but one is 16 years old now and hasn't bloomed, others are 11 years old with no bloom. The others bloom regularly year after year, with several stalks and many increases. They are large clumps now of deep green foliage, quite erect and of good substance.

The fact that the Crinodonnas are sterile, makes me wonder if the bees are aware of this. I watched a huge black bumble bee visiting the Brunsvigia flowers and he'd occasionally fly to the Crinodonna, buzz all around it a bit, then fly back to the Brunsvigias. Evidently the Crinodonnas smelled good but just didn't have what it takes.

After the first thorough deep watering of beds which have been left dry all summer, the rest of the little amaryllids of my garden push up their heads for September bloom. Habranthus brachyandrus and Rhodophiala spathacea come up immediately the second day after watering and within 5 days are in full bloom. Shortly after, the oxblood lily, Rhodolphiala bifida (red form) appears and then in rapid succession come Lycoris radiata, Habranthus texana, Zephyranthes candida, Leucojum Autumnale and a few early Sternbergia luteas, and hybrid nerines.

Meanwhile the Crinums have been blooming all summer and are still sending forth more scapes to compete with the other amaryllids. Ellen Bosanquet, both pink and light Mooreis, continue to tempt me to make more Crinodonna crosses in order that another September can bring forth more surprizes and more pleasure and more hopes for the future.

[GRUBBS—AMATEUR'S GROWING PAINS, continued from page 131.]

nursing them there will eventually be healthy plants. None of these have bloomed yet but seedlings of 'Violetta' self-pollinated produce off sets freely.

I have two clones of *Amaryllis belladonna* (syn. equestris), bright scarlet, which I would call a miniature. I bought one under the name of Barbados Lily, and the other was called "equestris". They are alike. These crossed readily with *Amaryllis evansiae*. It will be two or three years before these are ready to bloom.

Two other amaryllis I wish to use for hybridizing are *A. ambigua* and *Amaryllis* x *johnsonii*. You already know the trouble I am having getting these to grow and bloom, therefore about all I can say is: I have grown some remarkably beautiful flowers, have had an enjoyable experience and have some hybrids that, while not outstandingly different from others that are available, are a definite improvement over the Meade strain and other cheaper bulbs sold in garden stores. Many of them have one or more of the following traits: large size, good substance, good form, good color and rapid propagation. By combining the best of these traits by further crossing I have some hopes of having a very good collection of my own amaryllis. Perhaps when they are more readily available I can acquire other species to add some new trait to the strain.

My increasing success with outdoor culture is facilitating my hybridization program because I cannot handle any more plants in the greenhouse. I have had to discard a considerable number of bulbs grown in my outside beds because they appeared to have the Mosaic disease. I am very much inclined to believe that this diseased condition is either caused or carried about by spider mites. They are the most plentiful and persistent insect pests in this area. One other pest that is very destructive in the outside beds is the *Narcissus* bulb fly. Thanks to Dr. Traub's Amaryllis Manual I now have this pest under control, at least for the present.

PALESTINE (TEX.) AMARYLLIS SOCIETY FOUNDED

As we go to press word has been received that The Palestine (Tex.) Amaryllis Society was organized on February 5, 1963. It is affiliated with the American Amaryllis Society. The officers are: Miss Lucy Woods, Pres., Mrs. Arcala Harrington, Secy., and Mrs. J. H. Handorf, Treas. We all extend our congratulations.

Fig. 17. Left, Wire screen in 3/4 inch-mesh set in steel frame for sifting soil used in the initial preparation of the beds. Right, seed bed inclosed on the sides with corrugated steel sheets cut lengthwise in half and bolted on the angle iron standards firmly planted in the ground.

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

AMARYLLIS CULTURE & BREEDING IN SOUTH AFRICA

Leon Boshoff-Mostert

'Kleinskuur', Balfour, Transvaal, South Africa

INTRODUCTION.

When I asked your Editor what he wished me to write about in my promised article for the next Year Book, he left me a wide open field embracing breeding and culture in almost all their aspects related to the practical approach as applied by me here at Kleinskuur. Paradoxically, such a mandate is both easy and difficult to discharge. Easy, because it amounts to a mere narrative of daily and seasonal activities and yet, difficult, because of charishness that dogmatism might inadvertently be ascribed to personal methods of procedure where it is not intended.

Other than in basic principles, it is imprudent and may even be harmful to lay down hard and fast rules. Just as in the field of medicine and dietetics divergent treatments may have equally beneficial results, so also in the field of horticulture different circumstances, conditions and climatic variations call for divergent methods in culture. It must, therefore, be appreciated that this article is not to be seen as an attempt pedantically to tell the reader what he should do, but rather as an endeavour to tell the reader what someone else is doing according to the dictates of conditions applying to his particular geographic sphere of operation. As an example, let us touch very briefly on the question of potted bulbs.

The thought will never occur to me to submerge potted bulbs in open beds during Spring and Summer and then to retrieve them in Autumn for Winter storage in the warm cellar, awaiting the return of favourable climatic conditions for the repetition of the cycle. And yet, this is exactly what I witnessed during my visit to your Mid-West with its extreme Winters.

With the application of some degree of common sense, however, much of what is being done on the Eastern Transvaal Highveld where I live, can be put into practice in other regions without much or perhaps any modification.

Let us not concern ourselves with what comes first, the seed or the bulb, but let us commence somewhere in-between, namely, with the bloom from which we intend gathering seeds for natural propagation of new varieties.

CHOICE OF PARENTS.

(a) *Colour:* It is axiomatic that parents will be selected only from bulbs displaying those attributes which in the eyes of the breeder hold potentialities of producing that which will lead ultimately to the apex

of perfection as seen in the light of present-day standards. I repeat "in the eyes of the breeder", since, fortunately, tastes vary and consequently we have the spice in variety. Having regard to the element of taste, I shall not venture on the dangerous terrain of preference, bias or prejudice. I would, therefore, advise that irrespective of your neighbour's opinion on the matter, you just go for your own colours. Since it is the first thing to catch the eye, colour is of utmost importance. As one considers the progress left to us as a legacy by students, breeders and writers during the past century or more, one cannot but conclude that the ultimate in perfection is in sight in many aspects of breeding and that the scope for active endeavour lies more in the direction of evolving new colours and enhancing their beauty as regards clarity, shading and depth and the creation of attractive blends and combinations of colours.

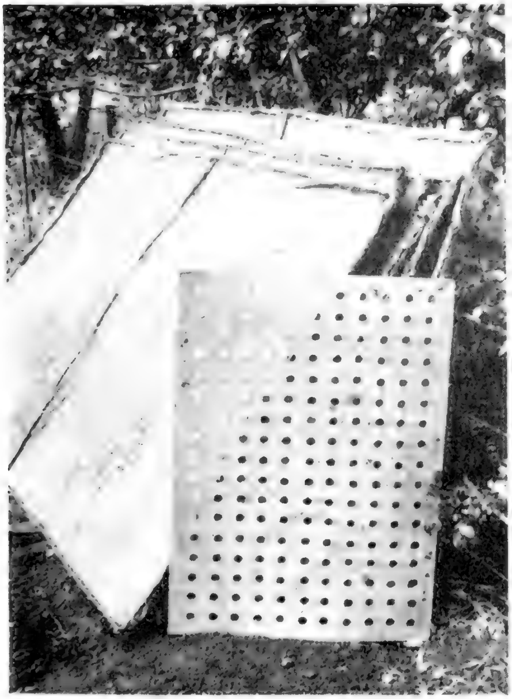
(b) *Texture:* In the textural field, the scope is not as expansive as in the case of colour. It must be obvious, however, that texture plays an important role in the presentation of a bloom and can become an additional instrument in the creation of variety, even in blooms with identical colouring. A glossy texture portrays a radiant glow, whereas the seersucker or crepe texture stirs up a feeling of sympathetic warmth. Boldness, on the other hand, is inherent in the bloom with heavily veined texture, more especially in the monochromes where the veining stands out in deeper tones. Then again, a leathery texture brings an illusion of increased size, whereas the velvety texture creates different shades or tones of colour depending on the angle of reflected light. These variations in texture are latent in the general cross-section of the hybrid we have to-day and it lies in the hands of the hybridist to bring these characteristics into prominence.

(c) *Substance:* The importance of the lasting properties of a bloom should not be overlooked. This applies in particular to the fancier who wishes to display on the show bench. Nothing can be so distracting as a wilting floret next to a later one just in the process of unfolding to the full glory of its beauty. Through selective breeding by the introduction of pollen from stronger parents, such shortcomings can eventually be overcome.

(d) *Size and Form:* During the past few decades hybridists have conscientiously been concentrating on form and size as much as on any other aspect of the Amaryllis. Much of the crane neck and trumpet shape has been outbred. Wider and rounder segs remain the target and the flat open face will continue to allure the breeder.

(e) *Vigour of Plant Growth:* A vital consideration in planned breeding is vigour. In your pollination programme do not play around with the runts, with short and weak scapes, unless you have one with some singular property worthy of perpetuation. In that event, by all means concentrate on the introduction of such property in one or more of your presentable vigorous specimens lacking in that enviable attraction. The majority of the offspring will, no doubt, also be runts but the possibility is always present that you may strike it lucky with the right mutation of genes which no man can forecast.

In the foregoing paragraphs I have listed the basic factors for consideration in breeding. It now rests with you to formulate your own creative aims and choose the parent plants accordingly, bearing in mind that the possibility of the combination of the attractive attributes of the respective parents in their issue is always present. Results, alas, are such that one often becomes disheartened by failures. But just think of the encouraging consolation that in our common heterogeneous make-up of humanity, beauty contest winners are born regularly in



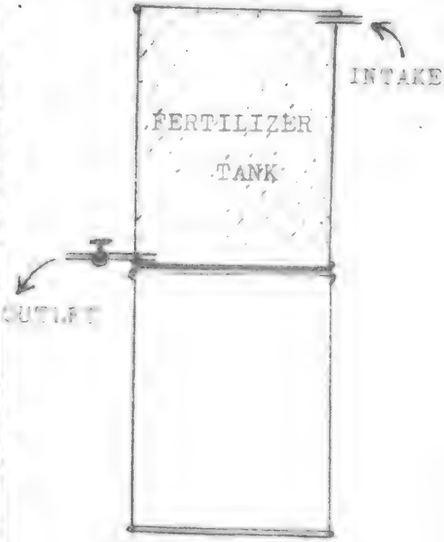


Fig. 18. Left, pressed-wood planting board with holes spaced 2 inches apart; behind this are stacked some of the steel framed hessian covers used for protection against frost and hail. Right, mobile fertilizer tank on empty drum which serves as a tank stand.

every country, whilst even the generous crop of runners-up remains the envy of many a male heart!

Whilst writing this, I lay no claim to being a student of genetics and neither do I profess to be an authoritative hybridist. I have learned from others, from the writing of others and, particularly, from the experience of my own few successes and countless failures over the past fourteen years during which my attention and energies have been devoted almost entirely to my Amaryllis.

Whilst in the U. S. A., I had the singular privilege of extensive talks

in La Jolla, California, with a man whom everyone knows to be an expert on Amaryllis and whom I, personally, regard as the greatest authority of all time in that sphere. It was from Dr. Traub that I learned,

Fig. 19. Upper, farm helpers commencing with first turning over of a compost heap 50 ft. long, 4 ft. high and 6 ft. wide. Lower, center, young bulbs in second season growing in open beds; right, a fine stand of Tamboekie grass for winter covering of open *Amaryllis* beds.

amongst many other things, about the storage of pollen in gelatin capsules in the refrigerator. Consequently, over the past two seasons I have successfully applied pollen to blooms up to eight weeks after the paternal bulb had finished blooming.

A further valuable breeding hint given me by Dr. Traub was the collective gathering of pollen from chosen parents in a common capsule and the application of this admixture of pollen to the chosen mothers. All the breeders I have thus far met have a common regret, viz. the short span of their lives. But in this advice I find a short cut in breeding which to a large measure defeats the obstacles presented by the limitations of the allotted "three score and ten years". It is with keen anticipation that I await the first blooms from the results of my collective pollination.

PLANTING OF SEEDS

A suitable medium for the seeds is essential and seed pans and seed beds should be prepared even before the pollination programme commences, so that the seeds may be planted as soon as possible after maturity. *My experience is that the longer the seeds are kept after maturity, the smaller the percentage of germination.* As for suitable media, so much has already been written and literature on this subject is readily available in abundance. I shall, therefore, confine myself for
the purpose of this article to my own methods of propagation.
Since I propagate from seeds on a relatively large scale for a one-
man outfit, and personally have to attend to all the planting and after-
care, I seldom make use of seed pans. With very rare exceptions the
seeds are planted in beds in the nursery. Efficient drainage must be
ensured whilst at the same time the beds must remain sufficiently moist
to ensure optimum germination and speedy initial development.
Our soil here is of a heavy, tight, texture which quickly dries with
a hard upper crust and proper preparation of the beds becomes neces-
sary. In the intended seed beds are worked in liberal applications of
coarse sharp river sand, peat moss, vermiculite and well decayed compost
prepared from vegetable matter and animal manure. These four in-
gredients are applied in equal proportions in bulk, i.e., a layer of two inches of each, one on top of another, is spread over the entire surface of the bed. It is then thoroughly worked through with garden forks and subsequently screened to a depth of fourteen inches through a portable upright sieve of 3/4 inch mesh (see Fig. 17).

To afford protection against frost and hail, the beds are enclosed in sides of metal sheeting. For this purpose corrugated steel or aluminum sheets, lengthwise cut in half, are used (see Fig 17). These sheets are rigidly attached to and supported by angle iron sections firmly planted into the soil along the sides of the beds, thus giving a complete substantial structure. As the entire erection is set up with bolts, it lends itself readily to dismantling and conveyance to other locations later on.

For the provision of top covering, portable frames constructed of 3/8 inch round mild steel bars are covered with 1/2 inch mesh wire netting and over this is stretched and sewn on a covering of hessian (see Fig. 18).

The seedlings not only survive our Winter frosts in these seed beds but they continue growing, provided they are covered at night with the hessian frames which are easily handled by one man and, during the day, when the seedlings enjoy full sunshine, are conveniently stacked

close to the beds. Since we live in a summer hail belt, the covering can also be quickly applied in the event of hail storms. Incidentally, I have a special patch of 7 beds of mature bulbs, each bed being 4 feet by 45 feet, completely covered under fine mesh wire netting as a permanent protection against hail (see Fig. 20). In these beds I have bulbs representing all my varieties and the unit is virtually a show window for visitors in the event of the open beds being damaged by hail during the blooming season, when visitors from all parts of the country come here by the hundreds.

It has already been stated that the seed beds are prepared well in advance. They are then regularly watered to induce germination of any weed seeds that may be in the soil and compost. These are soon under control and the subsequent weeding, by the time the Amaryllis seeds germinate, is relatively insignificant.

The beds are carefully levelled with a plank and are now ready to receive the seeds. This past season I planted just over 12,000 seeds and planting commenced when the first seeds were ripe. The seeds are planted to a depth of about 3/8 inch and for this purpose a light board of pressed wood is used. It is cut to the width of the seed bed and the length may vary to taste or to the requirements of practical handling. I find a square board suitable for my purpose. Horizontal and vertical lines are drawn on the board at distances of 2 inches and holes of 3/4 inch diameter are drilled at each intersection of the lines, i.e. the holes are spaced at 2 inches in all directions (see Fig. 18).

An addditional planting instrument is a simple 4 inch length of dowel cut from 3/4 inch diameter round wood. This is inserted in one of the holes in the board and pushed through a distance of 3/8 inch on the under-side of the board, whilst a pencil mark is made on the dowel, level with the upper side of the board. A nail is driven through the dowel at the pencil mark and this prevents the dowel protruding more than 3/8 inch to the under-side when it is thrust through the holes in the board.

We are now ready to start planting and the board is laid flat on the seed bed. The seeds are placed singly into the holes and pressed into the soft friable medium, all to an equal depth of 3/8 inch, without damage to the seeds. It will be found that a slightly moist medium works best. After seeds have been pressed into all the holes, these are then filled up with a covering of a moisture retentive mixture of vemiculite peat moss and sand, level with the upper surface of the board. The board is then carefully lifted and shifted forward along the bed to receive the following batch of seeds. A liberal sprinkling of water is applied by means of a soft spray from a watering can equipped with a fine hose. The little round mounds of covering medium left by the holes in the planting board are soon washed level with the bed. This operation is repeated till all the seeds have been planted.

This method can also be applied in planting in seed pans. In that case, naturally, the board is cut much smaller to fit the pan. The advantages of this method of planting are manifold. It is a time saver. The seeds are all planted to an equal depth. The emerging seedlings are

spaced at equal distances which simplifies subsequent weeding. Furthermore, the bed gives a neat and orderly appearance which is pleasing to the eye.

It will have been observed that chemical fertilizers were not introduced in the seed beds before planting and I do not propose to offer technical reasoning for this procedure. My own practice is to allow the seedlings to develop some measure of leaf and root growth and after six weeks or so from the time of germination, during all of which time the beds are constantly kept moist, I commence with applications of liquid manure or liquid fertilizer at 10 to 14 day intervals. Care is exercised to avoid an over-strong solution and the liquid feeding is always applied after a regular watering.

Your garden requisite stockist should be able to supply a suitable balanced fertilizer for liquid application and the strength of the solution is normally indicated on the container.

Since the plants are spaced at 2 inch distances, the bulblets may be left undisturbed in the seed beds for a year or longer and with proper care and feeding development is rapid and continuous. I have already had blooms from seedlings 23 months after planting but these, however, are rare exceptions. Normally, they start blooming from the third year onwards and, in slow maturing varieties, sometimes produce their blooms as late as in the sixth year. It is advisable not to remove the seedlings to their permanent beds until they have grown to a size of at least one inch in diameter. When lifting, handle with utmost care and endeavour to disturb or damage the roots as little as possible. Do not let them lie around but plant in the new location as quickly as possible after lifting and give a liberal initial watering.

PERMANENT BEDS.

The size and the shape of the beds depend upon ones own taste, convenience and garden lay-out. Here at Kleinskuur all the beds are now 4 feet wide with five bulbs in the row and rows spaced one foot apart. The bulbs are spaced ten inches apart in the rows. Hand weeding and cultivation are done from both sides of the bed which means a maximum stretch of two feet to the centre of the bed. At present, there are 141 beds, all 4 feet wide and ranging in length from 20 to 45 feet. If all the beds were placed in one continuous line, it would extend over a distance of almost a mile.

Kleinskuur is a commercial undertaking and, consequently, there is a bigger than normal turnover of beds as a result of annual lifting and shipment of bulbs. But if a bed is well prepared in the first instance, there should be no reason for lifting and transplanting of bulbs for many years. The necessity for transplanting will be determined by the extent and speed of natural increase. For the best blooming results the bulbs should be lifted for division and transplanting only when overcrowding becomes evident and they start pushing one another out of the soil.

Extensive use is made here of compost prepared from green vegetable matter and cow manure which is in plentiful supply. This is

prepared in the orthodox method of layering above ground and turning over at normal intervals (see Fig. 19).

In the initial preparation of a permanent bed, an even sprinkling of 5:13:5 is applied over the surface of the entire bed at the rate of 6 ounces per square yard and then lightly worked in with a garden fork. Then comes a 4 inch thick layer of well decayed compost thoroughly worked into the bed to a depth of 12 to 14 inches. At this stage my beds are sifted from end to end through the ¾ inch mesh screen. This, of course, is not essential provided the compost is equally distributed in the soil by repeated working with forks. The beds are then levelled off and the bulbs are planted.

Whereas in the case of potted plants in a sheltered location the bulb is set into the medium with up to half its 'body' above ground, this method is not advocated in the open beds. Here the bulb is planted to the depth of the curve of its 'shoulder' with the whole of the 'neck' protruding above ground.

With these beds additional application of fertilizers will not be necessary during the first season. With regular and sufficient watering, growth will be vigorous. As soon as the upper crust of the beds is sufficiently dry to permit of cultivation after each watering, the soil around the bulbs is lightly cultivated with suitable hand tools to a depth of 2 inches. This practice ensures better retention of moisture besides affording regular aeration of the upper layer of soil.

Throughout the growing season the beds are regularly irrigated. Here again, hard and fast rules must not be prescribed. Climatic and weather conditions alone will determine the frequency of watering. During the rainy season we are often not required to irrigate for a few weeks on end.

With the advent of Winter and the fall of the first frost, the bulbs enter the dormant period and all watering is discontinued. The beds are covered then with a thick layer of grass which serves as a Winter blanket. For this purpose and to eliminate transport, I have planted stretches of suitable perennial indigenous Tamboekie grass adjacent to the beds (see Fig. 19). In early Spring the grass is removed and neatly stacked and the beds are again irrigated. Much of the food in the soil has by now been consumed after the first year of luscious growth of bulbs and the need for fertilizing must be considered.

There are so many proved methods of fertilizing established beds, such as mulching with rich compost or spreading of fertilizer between the bulbs and then working into the top layers of the soil. My mind, however, is continuously exercised in the direction of labour-saving methods and devices. Although I can say nothing against the proved conventional methods of provision of additional plant foods, I find it easier and more convenient to apply liquid feeding. I am also convinced that liquid fertilizer is more readily assimilated and since irrigation is done here by an open hose-pipe laid on the beds and continuously shifted along the length of the beds, the liquid fertilizer is introduced in a similar manner.

Two fertilizing tanks have been constructed which operate in conjunction with each other. Whilst the one dispenses liquid fertilizer, the other is at the same time being filled up with water. The tank is made from a regular 44 gallon oil drum with an open top. It has a short piece of 1 inch piping welded into the side just below the upper open brim and this acts as the water intake pipe. Another piece of similar pipe is welded into the side at the bottom end and this is the outlet pipe which is fitted with a stop-cock (see Fig. 18). The bottom stop-cock is closed and the tank is filled with water almost to the top by means of a hosepipe attached to the upper inlet pipe.

Fig. 20. *Amaryllis* display beds completely covered under fine mesh wire netting as permanent protection against hail.

The correct amount of fertilizer for a 44 gallon solution is measured off and dissolved in a bucket of water. The strong solution is then added to the water in the tank. A second hosepipe is attached to the bottom discharge pipe, the stop-cock opened and the beds irrigated in the normal manner. Whilst this is being done, the complementary tank is filled through another hosepipe attached to the water main. By the time the one tank has discharged its liquid fertilizer, the other is full and so the process is continued until all the beds have been watered and, in the process, fertilized.

To provide sufficient pressure (not much is required for an open 1 inch hosepipe), the tank is placed on top of another drum. These units are portable and can be handled by one man. Water is laid on along all the beds and standpipes with hose connections are provided at suitable intervals. The hosepipes are long enough to do quite a series

of beds before the tanks have to be removed to new positions. This method of watering involves very little more time than direct watering from the pipelines and fertilizer is introduced to the bulbs simultaneously. These operations are carried out at fortnightly intervals throughout the growing season. Regular ordinary water, as and when required, is attended to in between.

Whilst on the subject of watering, here is some sound advice: Well established bulbs with fully developed root systems and healthy leaf growth can take a lot of watering. This, however, does not apply to newly planted bulbs. These should, during the establishing and developing stages, be kept reasonably moist at all times to stimulate growth, but please be very careful about over-watering because, at this stage, the possibility of rot is always present.

In the next issue of this publication I hope to give further information on the cultivation of Amaryllis in our part of the world. Meanwhile, letters from readers desirous of obtaining further specific information on activities at this end will be very welcome. Kleinskuur has a world-wide circle of friends and correspondents and we love receiving letters from them. In conclusion, I wish to thank my many friends I have made during my visit to the U. S. A. for their regular letters which are greatly appreciated.

BOSHOFF-MOSTERT HYBRID AMARYLLIS

Mrs. B. E. Seale, *4036 Prescott, Dallas, Texas*

Amaryllis growers, enthusiasts and importers of *amaryllis* bulbs had the pleasure of meeting, entertaining and hearing the interesting and informative lectures of Mr. and Mrs. Leon Boshoff-Mostert from Balfour, South Africa, when they were on a tour of the United States in the Spring of 1960.

They lectured to Men's Garden Clubs, Women's Garden Clubs, Amaryllis Societies and groups of just plain lovers of flowers in many cities. We were especially fortunate in Dallas to have them as our guests for five days. They were presented to members of The Dallas Amaryllis Society and two hundred invited guests at the North-Wood Country Club for a Luncheon meeting, followed by a Lecture—Tea, in the afternoon. They spoke to The Men's Garden Club of Dallas, Dallas Iris Society and the Dallas Hemerocallis Society at their evening meetings.

The lectures were illustrated by many exotic color slides of the Amaryllis grown at Kleinskuur, Balfour, Transvaal, South Africa; and the pictures of their home and plantation of several thousand acres were beautiful.

In June 1960, I sent an order to South Africa for some of his Amaryllis bulbs. The carefully packed parcel of bulbs was received by me on September 8, 1960. To my surprise, most of the flower scapes were well advanced upon arrival. I potted them immediately and in about a week, one short scape with four beautiful blooms opened on one

bulb. The other eight bulbs bloomed in rapid succession, except one bulb and it waited for almost a month before sending up two scapes; one scape had four blooms and the other one had three blooms. They were exquisite and the foliage grew right along with the blooms. Most all of the bulbs had two scapes with three and four blooms per scape; one bulb had three scapes.

The foliage that grew a little ahead of the bloom scapes was very beautiful. I kept the bulbs growing in the Garden-room of my home during the Winter months and we enjoyed the green foliage as Potted Plants. After danger of frost was over in the Spring of 1961, I planted them in the garden in partial shade under a large pecan tree. They grew in the garden all summer, until early October, when I took them up and stored them for three months.

In early January, I potted them and growth started immediately. First the foliage showed and by the time the scapes that followed were in bloom, there was sufficient foliage to make a beautiful potted plant, not just a bare *Amaryllis* bulb in a pot. I believe one of the most rewarding and outstanding things about these *Amaryllis* from South Africa is the growth of the foliage along with the bloom scapes.

It has been remarkable how these South African Amaryllis have adjusted to our northern hemisphere time of blooming. The extra months of growing time (13 months in all) were well spent, because they made a magnificent showing this Spring (1962). They are growing this Summer in "The Amaryllis Circle" in my garden. The size of the bulbs is increasing, (no shrinkage after blooming), and the foliage is very heavy. Some have small off-sets and all of the clones were good self-seeders and they crossed well, also.

This past spring I entered all of the South African Amaryllis in two Spring Flower Shows; some as Potted Plants and some as Specimens; each entry was awarded a Blue Ribbon and one, 'Kathleen Dobson' was given an Award of Merit for "The Best of The Show" in the Horticultural Division. In the same Shows, I entered 'Rose Queen,' 'Dido' and 'Zenith' (van Meeuwen hybrids) and they won Blue Ribbons also.

The following notations on the South African Amaryllis were made while they were in bloom in the Spring of 1962:—

'Cathedral Peak' is a blood red self, almost a purple hue; produced two scapes of four blooms each, about seven inches across the face (see Fig. 21).

'Eastern Glory' is a very dark mandarin red, with blood red influence; two scapes, four blooms each. Very striking in the sunshine with a glowing sheen; extra long and wide foliage.

'Kathleen Dobson' is a snow white with faint broken pencil lines of cardinal red on upper petals; frilled edges; two scapes with four blooms per scape and both were in bloom at the same time (see Fig. 21).

'Kismet' is a very large white, shaded with carmine veining; it has an iridescence or mother of pearl reflection in the blooms; produced two scapes with four blooms on each scape. It is a "must" in any Amaryllis grower's collection. The seed pods matured well.

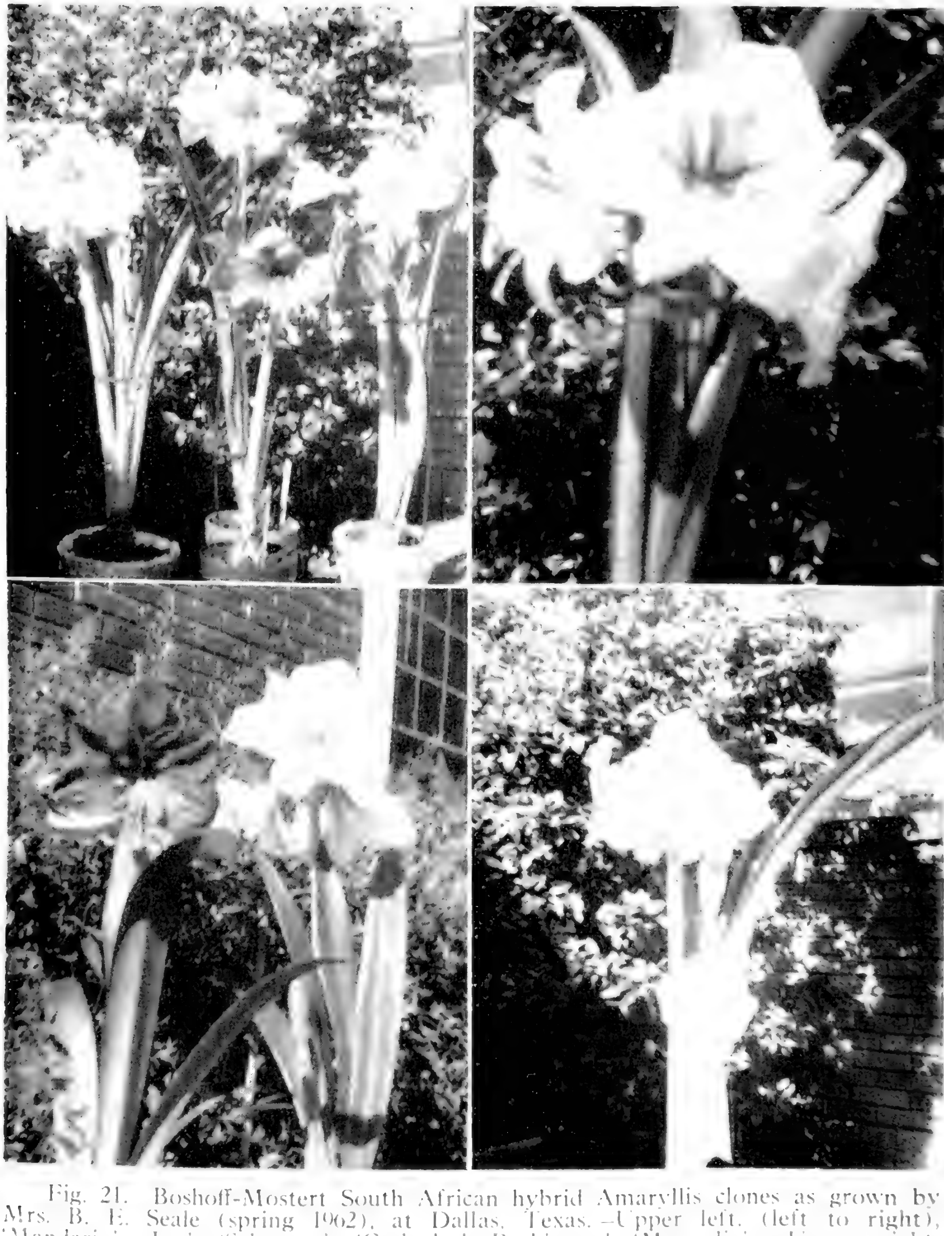


Fig. 21. Boshoff-Mostert South African hybrid Amaryllis clones as grown by Mrs. B. E. Seale (spring 1962), at Dallas, Texas.—Upper left, (left to right), 'Mandarin's Joy', 'Schooner', 'Cathedral Peak' and 'Magnolia'. Upper right, 'Kathleen Dobson'. Lower left, (left to right), 'Wisley' and 'White Belle'. Lower right, 'Dixie'.

'Mandarin's Joy' is a dark mandarin red self; very beautiful, with large round flat blooms; three scapes—two scapes had four blooms and one scape had three blooms; the scapes were extra long (see Fig. 21).

'Magnolia' is a large creamy white; green flushing toward the center; produced only one scape with four blooms; seed pod was very small (see Fig. 21).

'Schooner' is azalea pink, flushed white—has almost definite stripes; very large and decorative; it is a beautiful Amaryllis and had two scapes, with four blooms per scape; did not set seed (see Fig. 21).

'White Belle' is an exquisite, large (8-inch), flat faced, pure white Amaryllis; produced two scapes of four blooms per scape; good seed setter; foliage was luxuriant and is an exotic plant (see Fig. 21).

'Wisley' is a deep azalea pink; very large blooms of fine form and clear color; produced two scapes—one had three blooms and the other had two blooms; I am hoping that it will do better next year; I am giving it extra food for better growth (see Fig. 21).

Most all of these Amaryllis made large, full seed pods. As soon as the seed pods were mature. I planted them in one pound coffee cans. I have twenty cans with seedlings about four inches tall—they are growing in semi-shade and I can hardly wait to see how some of the crosses will result.

The one year old seedlings from the first blooms in September 1960 are very sturdy and strong in growth, with straps 14 to 18 inches in length. I am hoping to have excellent results from these since the Boshoff-Mostert Amaryllis are based on selections of the Buller strain given to him by Mr. Buller prior to 1952, and Mr. Boshoff-Mostert has apparently been improving his own strain since that time.

EXPERIENCE WITH HYMENOCALLIS VELARDEI

JOSEPH D. SMITH, *California*

Two years ago bulbs of an *Hymenocallis* species were obtained from Dr. Vargas that he had collected in the Department of La Libertad, Province of Trujillo, locality Trujillo, Peru. The general appearance of these bulbs was quite a bit different from that of other *Hymenocallis* species. They were tear drop in shape and tapered into a long thin neck. They were about an inch and a half in diameter, and their thin blackish brown skins were a beautiful thing in the bulb line.

They were planted and when the foliage appeared it was tapered to an acute point. It arched over gracefully from a pseudostem much like the foliage of a Pamianthe. Bloom was anxiously awaited but did not occur until the beginning of the second growing season which followed a dormant period in which the foliage disappeared completely, as with the members of the Ismene group of *Hymenocallis.*

When the spathe valves had separated enough for the buds to be seen it was obvious that this was a new species of *Hymenocallis.* The striking thing noticeable at this stage was the extremely short tube and a very short pedicel. This arrangement places the flower in close to the umbel with only the ovary between the two parts. The length of

the pedicel is 0.5 cm. and that of the tube 0.6 cm. Four flowers to the umbel have been noted as so far.

When the flowers opened more new features were observed. It was at once obvious that this was in the Elisena group due to the deflection of the cup. The over all flower color was a light greenish yellow. The stamens were 8 cm. long and straight. The cup was small, 1.5 cm. long by 1.5 cm. wide at the brim, with a tightly rolled lip, and the whole cup was so flattened that there remained very little space within. No odor was noted from the flowers. The petals extend well beyond the cup and are narrow and heavily undulated. They are characteristically curled as in *Hymenocallis longipetala.* The over all effect is quite odd and at the same time very attractive. This species could lend several new features to the hybrid *Hymenocallis.* It might be possible to intensify the greenish coloring, and to shorten the tube length of new hybrids.

This species has been named for Dr. Velarde, a Peruvian botanist instead of Dr. Cesar Vargas, its discoverer, because there is already a *Hymenocallis* named *vargasii* which was named for Dr. Vargas by Dr. Velarde. So it seemed only fair that Dr. Vargas' discovery should be named for his friend. More bulbs of this species have been promised from Peru. The original two bulbs now in their third growing season are starting their reversal of season from that of the southern hemisphere to ours and have started growth and flowered in August this year. By another season they should start in May and flower along with the other *Hymenocallis* of the subgenera Ismene and Elisena. Apparently it would be possible to maintain these bulbs on a fall flowering schedule with winter growth by lifting them in spring and replanting in fall each year thereby having two seasons of bloom each year—from different batches of bulbs of course.

MOVING AMARYLLIS FROM ILLINOIS TO FLORIDA

Mrs. Fred Tebben, *Florida*

Box 281, Lake Hamilton, Florida

In November 1961, my husband and I moved our residence from Northern Illinois to Central Florida, and all my amaryllis were moved down here too. Some were moved in 1960 and were planted in a friend's yard where they carried on as best they could without any care at all. These were almost all seedlings, some having bloomed and proved to be most interesting, while others have never bloomed even though they are probably ten or more years old. Of this lot I think I lost a considerable number, but there are still over a hundred that I have moved from my friend's yard to a bed prepared for them in my own back yard. Next spring I shall hope for bloom from a great many of these and those not up to standard will be discarded and replaced with others.

A second lot of bulbs were moved to Florida in the spring of 1961, and these I had intended to plant on our own lots, but our builder

was afraid they would be plowed up or plowed under before the lawn was completed, so he planted them for me in his own garden. I moved them home last November when we first arrived here. They were Howard & Smith, African, Australian, and unnamed Dutch bulbs, and I am afraid I lost quite a number of these too. I thought all one had to do was to put amaryllis bulbs in the ground and they grew here in Florida without much care, but I find there is one dreadful pest that cannot be ignored and must be watched for all the time. This is the huge "lubber grasshopper" that is referred to in the Nehrling report written so many years ago when Henry Nehrling lived here in Florida. These huge grasshoppers measure three and one-half inches in length, and the tender center leaves of the amaryllis are their favorite food. Indeed they can make short work of any and all amaryllis leaves, although the blooms are nearly all gone by the time these grasshoppers appear. They can be knocked off easily and killed with a stick. In fact that is the best way to deal with them for unless one dusts and sprays all the time the frequent rains wash off the insecticides and leave the grasshoppers a clean garden to feast on. It is best to plant the bulbs completely covered up to the neck. If any part of it is left exposed the grasshoppers will eat that too.

I had kept all my named Dutch bulbs in the pots they grew in up North and I did not bring them down here until we came last November. I removed them from the pots, shook all the dirt off and packed them carefully in a box with wood shavings between and around them to insulate them and keep them dry. These I did not plant out till late January, and while all lived, not all of them bloomed. Those that did bloom attracted a good deal of attention and received lots of admiring comment for not many Dutch bulbs are grown around here. These have done quite well so I hope for more bloom from them next February. I am fortunate to have quite good soil in this section of the Florida Ridge Country so have had good growth with only the addition of good bulb fertilizers. None of the nurseries or seedsmen know anything about mulches, and since all I could get would be peat, I have not used any mulch so far. The bulbs that were planted here last fall remained green all winter and withstood temperatures down to 28 degrees, without being damaged by the cold. They were not protected in any way. I have planted the named Dutch amaryllis in a bed protected from the cold north winds and shaded somewhat by a large oak tree, so I hope they will withstand the cold. I do not want to dig them each year unless it is absolutely necessary.

There is still much to be learned about growing amaryllis in Florida and I would certainly welcome advice and help from any who might be willing to help an amateur. Before closing this brief article which Dr. Traub has asked me to write, I thought you might be interested in hearing about the "native" amaryllis that grow in abundance hereabouts.

There seem to be four species that do remarkably well here in spite of the lubber grasshoppers. First, there is the *Amaryllis striata* var. *fulgida*, which blooms in March and seems to want to go to rest imme-

diately after it has bloomed. This is the same old variety that used to be such a popular pot plant up north and did well when it was rested in the summer and grown in a sunny window in the winter. It has a deep orange (nasturtium red) bloom with the central greenish yellow star, slightly ruffled tepalsegs and flaring somewhat. It offsets rapidly and soon makes a fine clump of bulbs. The second I noticed is much like this one in color, but it has a less flaring bloom and has a round center spot of greenish yellow. At first I thought this smaller, daintier bloom must be *Amaryllis striata crocata*, but I am told that it is the true "*Amaryllis belladonna* L.," found everywhere here in old dooryards and gardens. Then, too, there are many *A.* x *Johnsonii* bulbs which produce their lovely red flowers with the white lines, and grow to huge height with long strap leaves, but do not increase as rapidly by offset bulbs as the two first mentioned. The fourth species grown here I have been so far unable to identify. It may be a different *johnsonii*, although it is lighter in color, and a daintier bloom with its white lines radiating from the center of the flower. It increases much more rapidly than the taller ones and I have seen clumps of at least twenty bulbs with as many as fifteen scapes per clump. I am most anxious to know what this species may be but as yet have been unable to find anyone who can tell me.

There are many rows of "Milk and Wine Lilies" as they are called here, a *Crinum*, the true name of which I have so far not learned. There are also large clumps of a *Crinum* they call the "Christopher Lily" that I must also learn the proper name for as time goes on [either *C. giganteum* or a hybrid of it.—Editor] There are many *Eucharis* lilies grown in pots here for they do not do well unless they are confined and crowded in a pot. I have found this true also of the clivias. They can not be grown out of a pot. My *Amaryllis forgetii* is doing excellently down here but I shall not try to put it out in the soil for I am sure it would not survive the cold even here in Florida.

Perhaps after I have lived in this state longer I shall know all the correct names for the bulbs I have described above, but I have not found any gardeners really interested in the true names. They "just grow them for their flowers." What's in a name anyway?

GROWING AMARYLLIDS IN NORTH GEORGIA

By Beckwith D. Smith, *3479 Rockhaven Circle, N. E. Atlanta 5, Georgia*

My last contribution to Herbertia on growing Amaryllids is contained in the 1960 issue, at which time the article was headed "Growing Amaryllids in North Florida". When the article was written, I was living in Jacksonville, Florida, with no thought that I would ever be elsewhere. It will be noted from the above heading that I am now (in 1961) "Growing Amaryllids in North Georgia", more specifically, Atlanta, Georgia. My employers, the American Oil Company, moved us in September of 1960. We had the gargantuan task of digging my

hybrids out of their Florida soil, packing and transporting in a trailer to our new location. We first settled at a location on Elmwood Drive, N. E., where the bulbs were duly planted after being spread out over a basement floor for more than a month. After the winter was over, we relocated to our present address, where the bulbs were again planted on a broad hillside in back of our new home. It was a surprise that any of the bulbs bloomed after the shock of being transplanted twice, but some of them did, regardless, while others blasted shortly after the bud tips emerged from the bulb tissue.

The clay soil in our present location contains little or no nourishment, other than iron, aluminum and some trace elements. So to provide the proper nourishments for the bulbs, each planting row was lined heavily with dairy fertilizer and further fortified with commercial 6-8-6, bone meal and liberal applications of Capco soluble fertilizer. Bulbs are responding well, although they seem to resent the full sun treatment, and are slower to grow. We are now in the process of mulching all planting rows with well rotted dairy fertilizer, and when leaves die down will further mulch with rotted sawdust. We know that North Georgia weather is cold, because last winter the temperature went down several times to 12 and 14 degrees in the Atlanta area, and there were two severe sleet and ice storms which left a blanket of ice on the ground for a week each time. This was at the location where the bulbs were first replanted, but fortunately all rows had been covered heavily with leaves, and somehow they carried through with but few freezing losses.

During the winter, indoors, trials were run on named clones of Ludwig, Van Meuuwen, Van Waveren and Warmenhoven Amaryllis which had been brought along in cellophane bags and repotted. Response was very good insofar as blooms were concerned, but scapes were shortened, no doubt due to having lain in the cool basement.

Trials have begun on hybrid *Amaryllis* raised by Mrs. J. S. Barry, of Route 1, Box 7, Prairieville, Louisiana. Mrs. Barry is hybridizing many Amaryllis from the major Dutch suppliers of named clones, and is meeting with great success in producing healthy, robust and hardy bulbs from crosses which she has made. Red, pink and white seedlings were furnished the writer the early part of the year, and bulbs forced inside produced remarkably beautiful flowers. Mrs. Barry is also producing many seedlings from named clones and from her own hybrids. We will continue trials on these bulbs this winter and hope to have some interesting material to report in a future issue of Herbertia. Meantime, we will expect a profusion of blooms from our own bulbs growing here in Atlanta next spring, and since the bulbs should have become better acclimated by that time, excellent color pictures should result. Now that we are in Georgia for what seems a number of years, we hope ultimately to meet all of the hybridizers and growers in the state. We have found that strains of Dutch *Amaryllis* do well for us out of doors in Georgia. We hope more Georgians will grow them.

[Mr. Smith's 1961 article above was received too late for inclusion in the 1962 issue and had to be held over to this 1963 edition. See

also Mr. Smith's 1962 article which appears under the Genetics and Breeding heading earlier in this issue.—*Editor*]

NOTES ON THE BLUE AMARYLLIS

Mrs. Adda Abendroth

In July 1961 I sent seven bulbs of the Blue Amaryllis to Sr. H. J. Eipper, Corupá, Sta. Catarina. On June 14, 1962 he sent me a kodachrome of *Worsleya rayneri* in flower. In his letter of Feb. 1, 62, Sr. Eipper wrote that 2 of his bulbs had flowers, one 3 and the other 4, of the loveliest lavender blue. On July 8th he wrote that all except the smallest of the 7 bulbs had flowered, the last one to bloom being the one on the picture he sent, with 5 individual flowers, some time late in April. In its native habitat on mountain cliffs around the town of Petrópolis *Worsleya* blooms late in January, as far as I can tell from sporadic trips to that town.

Petrópolis is situated at about 700 meters above sea level in the coastal mountain range along the Atlantic, an hour and a half bus ride from Rio. The only spot I have seen *Worsleya* growing wild is on the rocky slope facing east back of Orquidario Binot in the suburb Retiro. The rock rises abruptly to over 100 meters. Using binoculars I could make out large clusters of curved leaves and lavender-pink flowers nestling in crevices along transverse folds and steps of the rock among weeds and some shrubbery. Incidentally, a forest fire late last year destroyed all vegetation on that slope. In December the decline was quite naked and the crosswise folds were brown. On a visit to Binot on January 30th 1962, however, I could detect some green here and there with my glasses. Despite the overcast sky I also saw, I believe, an occasional patch of lavender. Only on a sunny morning would flowers there be plainly visible.

In Petrópolis, and also in our town, several Worsleyas grow in private gardens. Friends in Petrópolis tell me the plant is at home high up on mountains in their vicinity, and that once in a while bulbs are brought to the public market for sale. My friend's son said he knew where the plants grow not very far from their home in the outskirts of town. Attempts to persuade the young man to take me there failed, but during the July holidays he obligingly undertook a hike to the place and brought back as many plants as he and a helper could carry. They were huge, vigorous specimens. Part of them were then shipped to Corupá in the State of Santa Catarina, where they appear to be doing fine. Two isolated bulbs of the lot that are being cultivated in Teresópolis don't look happy and have not flowered in season.

Florists in Petrópolis know the lavender-flowered Amaryllis, but put no store by it "because it does not thrive in cultivation" they say. According to late Dr. Hoehne, (S. Paulo), however, a couple of bulbs imported in 1932 adapted well in the gardens of the Instituto de Botânica where they flower regularly. On March 5th 1952 Dr. Hoehne wrote me: "Our Worsleya bulbs have flowered time and again and just

now a large specimen growing on a rock in front of the glass house has a stalk with eight flowers. The plant takes an inclined position and the inflorescence protrudes almost horizontally while the leaves curve like the feathers in a portly rooster's tail."

The curved shape of the leaves inspired one of the popular names of the plant down here: "rabo-de-galo", meaning "cock's tail". (Hoehne in "As Plantas Ornamentais da Flora Brasilica, S. Paulo 1936). Pio Correa (Diccionario das Plantas Uteis do Brasil e das Exôticas Cultivadas, Vol. I) registers *Worsleya rayneri* syn.—Hippeastrum procerum under "Açucena" and "Flor da Imperatriz". Petrópolis being the summer resort of the Imperial family up to 1888, it may well be that this outstanding flower captivated the fancy of the Empress Theresa Christina, an Austrian princess, and that the inhabitants named it in her honor. Açucena is the popular name given to any Amaryllis-like flower here and in Portugal. Nowadays the name most used is "amarilis-de-flôr-azulada". Occasionally flowers are offered for sale in Rio Flower Market.

Hoehne thought "plenty of sunlight and altitude and lots of breeze seem to be the ingredients that bestow such exquisite loveliness on the large blue flowers, and that may be why cultivation in hot houses in Europe has met little success." (Plantas Ornamentais).

Worsleya is practically unknown in Teresópolis. Neither its looks nor its various names strike a familiar note among the country people and hunters and plant collectors. Carlos Toledo Rizzini does not include it in his Flora Organensis (Rio, 1954).

Theresópolis, Brasil,
July 20, 1962

AMARYLLID CULTURE IN MARYLAND

WILLIAM W. ZORBACH, *Maryland*

The writer resides in a suburb removed 11 miles north of downtown Washington, D. C. A prime consideration in the outdoor culture of amaryllids in this area is the nature of the soil, especially in the newer developments where the contractors have been careful to remove completely any top soil as did exist, or to bury same. Thus, most homeowners must contend with either hardpan or heavy clay or a combination of both. The writer recommends strongly the following procedure which he adopted late in 1959 when he moved into his present location.

Along the south wall of the house he removed completely the clay soil from a section 20′x3′x1′ in depth, save for about 3 inches from the top which was returned to the trench to impart substance. Along with this was added 2 bales of sphagnum peat moss, 20 small disposal cans of thoroughly decayed oak leaf compost to which ground limestone had been added, 25 pounds of Bovung, 10 pounds of bonemeal, and finally one ton of sand. The soil mix was turned over repeatedly until

thorough mixing was effected, and it was then tamped by foot. The bed is, fortunately, slightly elevated with respect to the yard, and the drainage is absolute. Owing to the fact that the yard is in full sun, a lath shade 5′ high was constructed over the bed. Plantings in the bed have been in general most successful, and the writer has been using it in particular as an experimental bed for wintering over various genera, inasmuch as the location is well protected in the winter.

A young bulb of *Crinum powelli album* was obtained in 1957 and was grown at the writer's former residence under unsatisfactory conditions without success. It was replanted in the late fall of 1959 in the newly prepared bed but during 1960 made leaf growth only. In 1961 the bulb divided, making several small offsets; leaf growth was excellent. In June 1962, the main bulb bloomed for the first time in five years and threw up four scapes in rapid succession (this was well worth waiting for!). Excellent bulbs of *C.* 'Cecil Houdyshel' and *C.* 'Ellen Bosanquet' were obtained from Wyndham Hayward in the fall of 1960 and were planted immediately. Each was covered with 6-8 inches of soil as measured from the neck of the bulb. Leaf growth began in the spring of 1961 as soon as the freezing weather was over. *C.* 'Ellen Bosanquet' appears to be somewhat more tender and is slower in starting. Both bloomed during the summer of 1961 and did even better during the present summer (1962). 'Cecil Houdyshel' produced 5 scapes, each 4½-5′ high, whereas "Ellen Bosanquet" came through with 4 scapes, not so tall as the former.

In a row along the front of the bed are planted some 35 *Rhodophiala bifida.* They are perfectly hardy in this location and even with the severe winter here in 1960-61 made excellent bloom in late August of the following summer. As this is being written (September 1962) they are again in bloom but have been doing so more or less sporadically. A likely reason for this is the fact that this past August has been the driest one in Washington weather history with only 0.055 inches of rain recorded. In Kensington 0.000 inches fell. Recently a little rain has fallen and the *R. bifida* have been doing somewhat better.

Six bulbs of *Brunsvigia rosea* (Cape Belladonna) were obtained from a seed company in 1958. The bulbs were planted at his former location without success, and along with the other amaryllids were dug and replanted at the present location in the fall of 1959. The leaves in cross section have the shape of a flattened "V", and tend to emerge in the late winter during warming spells. This is unfortunate because freezing weather invariably sets in again and kills "down" the emergent leaves. As spring advances the bulbs make leaf growth once more but the leaf growth is anything but luxurious, with the straps attaining a length of around one foot. Such was the case in 1959-60 and in 1960-61; consequently no scapes appeared. The last winter (1961-62) was quite mild, however, and spring came earlier. Leaf growth appeared early but was not set back, and the bulbs made excellent growth until early June when they went into dormancy. This August the writer was rewarded with 4 scapes, red-brown in color and about 30″ in height.

Each produced on the average ten orchid-colored trumpets, rather similar in appearance to *Lycoris squamigera*. In contrast to the latter which has an unpleasant oder and a rough texture, the subject flowers were smooth and had a delicate lemon odor (the editor's comments here are welcome). Other Amaryllidaceae which have been handled successfully as hardy bulbs here are: *Habranthus brachyandrus* and *H. robustus*, *Sternbergia lutea* and various *Zephyranthes*.

Of especial interest in the recent Amaryllis Year Book was Sam Caldwell's delightful article on *Lycoris*. Indeed, Mr. Caldwell's request for information on *Lycoris* from other "nuts" was chiefly responsible for this article, and he will no doubt be heartened by the information that the writer enjoyed a similar "success" with *L. traubii*. In the fall of 1960, six bulbs were obtained from Wyndham Hayward: four of these bloomed shortly after being planted. Leaf growth appeared but the cold weather which followed stunted the leaves. No blooms appeared in 1961 but during the fall of that year, leaves again pushed up. This time, the growth was even poorer than before with the result that no blooms were obtained. It is clear that the winter weather in this area is too severe for this species. Perhaps a cold frame would be the answer? *L. squamigera* offers no problem here, but in view of the desert-like conditions here in August, only five scapes appeared in spite of what might be considered heavy watering. It is my impression that *Lycoris* does best during periods with adequate rain. In this respect the writer cannot help but recall a letter of two years ago from Wyndham Hayward who remarked at how the hurricane rains in Florida that year had brought up the scapes of his *Lycoris* in abundance. *L. albiflora* are perfectly hardy here and are now in bloom.

The writer obtained a single bulb of *L. caldwellii* from Wyndham Hayward in the fall of 1960 and planted it five inches deep. Nothing happened and when the first of the year arrived the prognosis was indeed poor. December had been extremely severe and January was even worse. The weather was very cold and on one occasion, 16 inches of snow fell in the yard. Occasionally, a sunny, somewhat warmer day would appear and the writer would take advantage of this to remove the snow from the bed by hand especially for the sake of the *Rhodophiala* which is making growth at this time. On one such day late in January, the writer was greeted by an extraordinary sight. At a position where *L. caldwellii* had been planted a cluster of straps projecting about one inch from the soil surface showed. These maintained steady growth during the cold weather which persisted through March and the leaves appeared to be completely unaffected by the cold. Growth continued until late June, the bulb going into dormancy somewhat later than did *L. squamigera*. In mid-September of last year (1961) the writer was rewarded with a scape some two feet high. The flowers, on opening, were a pale yellow but after a day or two changed to near-white. This is truly a beautiful *Lycoris*. Leaf growth began around the first of February (1961) and showed that the bulb had divided. Two scapes appeared recently, confirming this observation.

Approximately one dozen *L. radiata* (red) were transplanted in 1959 but were placed in an ordinary and not so well protected location in soil consisting chiefly of clay, with some sand added. The bulbs did absolutely nothing for one year and it was decided that they had rotted. In November of 1961, leaves miraculously pushed up and reasonably good growth was made during the winter of 1961-62. Four scapes have pushed up to date; the failure of the others might be due, conceivably, to the dry conditions here this year. The writer's experience with the latter *Lycoris* certainly supports the contention that *Lycoris* takes a long time in becoming established.

In addition to wintering over hardy amaryllids, the subject bed is also employed for several tender genera. *Haemanthus multiflorus* blooms and grows well under the lath; in general this is found to be more satisfactory than growing them in pots. They are remarkably resistant to cold weather and one year one of the larger bulbs did not rest off until mid-December. Prior to this time there had been some hard frosts and even a few sub-freezing nights. The leaves were only slightly affected and the bulb, which was covered with about one-half inch of soil, was in perfect condition when dug. Obviously this is applicable only to bulbs making full growth. Last year the writer was careless and delayed for about two weeks in digging them after the leaves turned yellow. By this time some rot had already set in, but by removing the rot and treating with an antifungal agent, he was able to salvage most of his stock which this year is somewhat diminutive.

Sprekelia formosissima grows well here and the bulbs are dug after the first frost. Considerable difficulty has been encountered in obtaining satisfactory blooms in the spring, and the explanation for this is that the bulbs, especially the larger ones, tend to sprout in storage before the weather attenuates enough to permit their planting. Even if they are planted early enough, the buds tend to "blast" under the soil or rot altogether, and it is becoming increasingly apparent that *Sprekelia* handled as tender bulbs require warm soil for root growth to start. Perhaps one should handle those bulbs which show evidence of early bloom in pots in the house, and after blooming they could easily be transplanted to the open soil.

A single bulb of *Amaryllis immaculata* was obtained and was planted outside. It has made excellent leaf growth but has not bloomed to date. *Cyrthanthus sanguineus*, which are carried over indooors in a planter, are transplanted to the bed outdoors. They make good growth here and bloom in the early fall.

Finally a word about one of the amaryllid enthusiast's most trusted friends—*Hymenocallis narcissiflora*. Five years ago the writer started with 18 bulbs; he now has around 80 most of which are blooming size. In addition there have been produced some 100 small offsets which were given to friends. The *Hymenocallis* are not grown in the "amaryllid bed" but along the east wall of the house in light clay to which much sand and some peat moss have been added. They grow very well here as tender bulbs giving excellent bloom in late June some

14-20 days after they are planted. As with *Sprekelia*, they are dug after the first hard frost and are stored, as suggested, in a warm basement.

In conclusion, the writer strongly recommends his procedure for soil preparation for growing amaryllids outdoor in this area. Admittedly it is a great deal of work to accomplish initially, but in the end will save in time and minimize failures. Not only does the soil thus prepared make amaryllid culture practicable, but serves admirably for growing other plants of a tropical nature, such as *Gloriosa* and *Achimenes*.

ACCELERATED INCREASE OF AMARYLLIDS

L. S. HANNIBAL

The normal development of offsets in amaryllids can be accelerated by a number of simple horticultural techniques. The best known way has been employed by daffodil growers for fifty years or more, namely planting the bulbs quite shallow in a rich clay loam. This practice is particularly conducive to rapid bulb division or even splitting. The converse, deep planting, reduces offset development, but encourages large sized bulbs with blossoms suitable for the show bench. The writer has found that the same practices can be applied to many other bulbs, and that heavy fertilization in combination with shallow planting is particularly effective.

Secondly, we have the bulb cuttage technique where the bulb can be simply split with a knife or cut up into a number of pie like sections. Each has its merit. A bulb split at right angles vertically to the leaf axis without disturbing the roots will soon form two full sized bulbs. In contrast those cut up like a pie form a number of leaf axis bulblets along the leaf scale base adjacent to the basal plate. But since the segments from the original bulb have had the growth center split up or cut away, and since the roots are often lost, the rate of growth of the leaf axis bulblets is not as rapid as is normal for offsets. The growth rate is more comparable to that of seedling bulbs. This delay factor represents quite a disadvantage.

It was more by chance that the writer learned how to circumvent these delays. Leaf axil bulblets can be grown as rapidly as offsets. While digging some *Crinum* bulbs several had their basal plates partially torn loose. The bulbs were thrown into a leafy litter under an oak tree and forgotten. The following spring several clumps of eight to ten offsets were noted. Investigation showed that the intact portion of the basal plate had re-rooted and that scores of leaf axis bulblets had formed along the margins of the bulb scales where they had torn free from the basal plate. Some bulblets were growing up through the bulbs like normal offsets, others had reversed and were growing out direct from the face of the bulb scales where cut or torn.

Later experiments indicate that in early growing season cutting or notching away a portion of the bulb base would always produce axial bulblets along the margins of the cut leaf bases, and that this was par-

ticularly true if the bulb is planted shallowly or laid on the side. The best results were obtained when the cut area was kept above the ground level, but under a ground cover. In no instance should the growth center of the bulb be disturbed since the vigor of this portion of the plant is needed to accelerate the leaf axial offsets. Several notching patterns have been tried like those used on hyacinths but the preferred method appears to be a 30 degree pie shaped notch extending into the basal plate and lower leaf scale area about one-fifth the diameter of the bulb. Four or five notches can be cut in a single bulb without disturbing too many roots or the growing center. If planted shallowly each notch will yield from two to five leaf axis bulblets and often the notched pieces will yield an offset or two. The technique has been employed on *Crinum* without digging the bulbs with particularly gratifying results.

Plants like *Clivia* or *Haemanthus* can have the individual leaf margins notched to a depth of one eighth inch at the point of attachment to the basal plate or root stem. Bulblets will usually form in the cut margins in a matter of weeks. These should be left intact until roots have formed.

Another means of offset production was noted while experimenting with the sprouting of seeds and small bulblets with colchicine and acenaphthene. These mutagens cause an excessive number of bud sports to form in both the leaf axials and margins. These bud sport offsets are often tetraploid in character like the treated parent.

MORE ON LYCORIS IN NEBRASKA

Vivian Barnica Grapes

My garden is in western Nebraska about eight miles from the northeast corner of Colorado, an elevation of 3369 feet. We have cold winters with lots of freezing weather from November until April, and usually several days of sub-zero weather in January, the average lowest 20 degrees below zero.

My planting of *Lycoris* growing under the sheltering branches of a large cottonwood tree includes: *L. squamigera; L. incarnata; L. haywardii; L. sprengeri; L. sanguinea; L. caldwellii;* the one sold as *L. "cinnabarina"; L. houdyshelii; L. traubii; L. aurea; L. albiflora;* the one sold as "L. albiflora carnea" and some selections of *L. radiata.* I hope to add, for testing in Nebraska, bulbs of the later *Lycoris* discoveries as soon as they are available.

Lycoris squamigera opens the blooming season each fall around August 10. *L. "cinnabarina"* bloomed August 18, 1961, after two years in my garden. *L. sanguinea* blooms regularly each season around August 22. *L. haywardii* August 23—this one is irregular in blooming for me. *L. incarnata* is usually in full bloom by August 28. *L. caldwellii* bloomed for the first time September 11, 1960 after two years in the garden. The foliage of *L. squamigera, L. incarnata* and *L. caldwellii* appears around March 18th and the foliage of *L. haywardii* and *L. sanguinea* about two weeks later. The bulbs of all are planted four inches deep to the base of the bulb.

So far none of the *Lycoris* in Subgenus 2 have bloomed here after wintering in the garden, but the bulbs live over, some show increase and the foliage seems to be coming stronger on several this fall (1961) so I hope they are getting acclimated and will bloom later.

Crinum bulbispermum and *C.* 'Cecil Houdyshel' have been growing in the open since 1957 and they bloom each summer, *Galtonia candicans* planted at the same time, and *Arum italicum* in my garden since 1941, also bloom and set seeds. The Crinums and *Galtonia* lose their foliage in the fall and new foliage comes up in late spring, but the lovely foliage of *Arum italicum* appears in October and lasts through the winter and does not die away until after the blooming season.

The soil in this part of the garden is a sandy loam underlaid with gravel and has perfect drainage. I cover the bulbs each winter with three to four inches of wheat straw, I find that a heavier covering causes soft growth on the lycoris foliage which is more subject to freeze injury.

My grateful thanks are due to Mr. Hayward, Mr. Morrison and Dr. Traub for making it possible for me to grow some of the newer *Lycoris* species.

ARTIFICIAL LIGHT FOR AMARYLLIS CULTURE

RICHARD J. SUDD, *Illinois*

During the summer of 1960 my patience with the elements here in Northern Illinois was just about exhausted. Being able to have control over the wind, light, watering, etc., prompted my experimenting with the growth of *Amaryllis* under artificial light, in complete absence of sunlight. With the available space and electricity being one of the cheapest services in our area, I commenced my experiment.

In the past ten years I have been able to collect some hundred hybrids and species. This size collection made it impossible for me to grow all the bulbs under artificial light, but with those *Amaryllis* growing under artificial light the experiences and the knowledge obtained has been both enlightening and rewarding. Before I mention my experiences I think it would be worth while to give a picture of the environment and lighting arrangement.

All the *Amaryllis* species and hybrids are grown in the basement of our home, which is below ground level, and there the temperature range very seldom falls below 65 degrees F. in winter and above 75 degrees F. in summer. Even with the prolonged below zero weather during the winter of 1961-1962 the temperature seldom fell below 65 degrees, even when heat was not supplied. When heat was supplied, by a forced air heat plant, a temperature of 70 degrees with a humidity of 60% was maintained, if possible. During the summer months there is a rise in temperature and humidity, but with the added circulation of outside air, this was found to be beneficial. In the winter the forced air circulated by the heating plant was sufficient for ventilation.

The choice of fixtures is a matter of preference and in my case industrial fluorescent fixtures were used because of easy handling. I

obtained three fixtures with porcelain coated reflectors approximately twelve inches in width and each containing two forty watt fluorescent tubes (cool white). Having a little knowledge of electricity, I connected the three fixtures parallel on a fifteen amp line, which was added for this specific purpose. On the line the fixtures were connected to an outlet which was controlled by a switch and automatic timer. With the automatic timer the light source can be limited to any number of hours and at present I have limited this to fifteen hours for *Amaryllis* growth.

All three fixtures are suspended from the ceiling by dog chains. above a platform four feet by seven feet. The fixtures are arranged parallel to each other with a space of twelve inches between the reflectors. Arriving at the proper height of the fixtures was governed by the light energy measured in foot-candles, from the fixtures to the platform. Depending upon the type of fluorescent tubes and reflectors used, there will be a variation in illumination.

On the market to-day are a number of fluorescent tubes under which *Amaryllis* will grow. They contain blue, red, green and yellow parts of the visible color spectrum and for plant growth it is best to strive for a balanced lighting. For balanced lighting, obtaining the highest quantities of the blue and red visible color parts of the spectrum will give the best plant growth, as it is the blue and red rays that the plant utilizes for vegetative and bud formation. At the start of my experiment with artificial light, trying to achieve a balance of red and blue rays brought about the use of incandescent light bulbs and various types of fluorescent tubes. The incandescent bulb is a good source of red rays, but its use is hampered by the heat energy, which will burn foliage that comes in contact with it. Approximately eighty per cent of the energy of the incandescent bulb is heat whereas in the fluorescent tube only twenty per cent of the energy emitted is heat and this amount has no effect on *Amaryllis* foliage. Also it will be noticed that the fluorescent tube has an abundance of blue rays and sufficient red rays, so for a practical source of artificial light the fluorescent tube is adequate.

Any type of fluorescent tube may be used, but in my case I have found the best results are obtained with the use of the cool white fluorescent tube. This type of tube was used primarily for its brightness and to obtain an illumination reading of 200 foot-candles at the greatest distance between the *Amaryllis* bulb and the fluorescent tube. Using a light meter it will be found that a 200 foot-candle reading will fall approximately twelve inches beneath the fluorescent tube. All *Amaryllis* bulbs vary in size and to allow for the various sizes in the containers being used, an added twelve inches was needed to maintain the vegetative growth within the 200 foot-candle illumination. If the *Amaryllis* bulb had to be raised to maintain the vegetative growth within the 200 foot-candle illumination, empty flower pots were used. This method eliminated the raising and lowering of the fluorescent fixtures and the two feet spacing between the plant platform and fixtures I have found to be adequate.

The life of the fluorescent tubes used varied and to utilize the greatest efficiency of the tubes, I have replaced old tubes every six month

period. As the fluorescent tubes become older there is a considerable drop off in illumination. If the *Amaryllis* is receiving sufficient illumination the leaves at the neck of the bulb take on a dark lavender appearance and the remainder of the leaves become a dark green.

As mentioned previously the fluorescent fixtures were placed parallel to each other with a twelve inch spacing between the reflectors to help control the bending of the vegetative growth (phototropism). At present the position of the fixtures has worked satisfactorily, especially when the *Amaryllis* are in a budding stage. The *Amaryllis* is allowed to continue its growth and bud development directly beneath the fixture until the scape has reached the fluorescent tube. At this stage the *Amaryllis* bulb is placed between the fixtures with the leaves beneath the light and the scape continuing to develop between the fixtures. If the *Amaryllis* in bud is placed between the fixtures before the developing scape has reached the fluorescent tube there will be a considerable bending of the scape towards the greatest source of light energy. If the bulb has not developed a strong root system the bulb will not support the weight of the scape and flowers. Continued development of the scape above the fixtures was normal and bending of the scape ceased to a large degree. About the only bending of the scape will be caused by the reflected light from the surrounding area.

The flower development above the fixture was also normal. There was no noticeable change in the flower color or texture, but the lasting qualities of the flower seem to be prolonged more than those *Amaryllis* grown under outdoor conditions.

The growth of seedlings under artificial light with sufficient illumination shows great promise of bringing seeds into bloom within a two year period. During the winter of 1961 a few seeds from crosses among the Striata Group were planted and leggy or weak growth was not apparent under sufficient illumination. I was even surprised to see offsets produced after six months growth.

At the end of this year's flowering and growth, all fluorescent tubes I now have, are going to be replaced with a fluorescent tube made especially for plant growth. This tube is available under the trade name "Gro-Lux." (GRO-LUX is manufactured by Sylvania Electric Products, Inc., Salem, Mass.) It contains the blue and red rays, which cast a lavender glow and this is the closest to a balanced lighting yet available. From all reports plants growing under "Gro-Lux" are superior to those grown under other sources of light energy. What effect this new source of light energy will have on *Amaryllis* growth, I hope to discuss at a later date.

For those individuals who wish to experiment with *Amaryllis* growth or other forms of plant life under artificial light, there are many articles that have been written and which are available to the public. The U. S. Department of Agriculture, Agricultural Research Service has available many articles on the subject of light effect on seed germination, plant growth and plant development. I would like to recommend one article (Publication No. 879) available from the U. S. Government Printing

Office, Superintendent of Documents, Washington 25, D. C. This article titled "Light and Plants" gives general information and a series of experiments demonstrating light effects on plant life.

WINTERING AMARYLLIS IN THE NEW ORLEANS AREA

W. J. Perrin, *Louisiana*

This article has to do with the average home garden and not the commercial grower planting large plots. The record breaking freeze of January 10, 11, 12, 1962 in which we experienced a low of 10 degrees, may not happen in years to come; however, the safe way is to plan and be prepared for the worst at all times. Much bad publicity was given *Amaryllis* immediately after this severe freeze. Some would have you believe *Amaryllis* cannot stand a three day freeze in this area. The Men's Amaryllis Club of New Orleans Show, staged April 7th and 8th, in which an abundant number of flowers were shown, best proves that *Amaryllis* is well capable of taking care of itself in cold weather.

Those planting *Amaryllis* in this area should keep three things in mind: 1. Drainage; 2. Mulch; and 3. Location and Exposure.

Drainage and mulch are a must for without these the normal winter will damage bulbs. Location and exposure, not much heard of until the late freeze, now becomes No. 1 in importance. It has been proved that *Amaryllis* will not take the strong north icy winds blowing in their "face."

Figures 22 and 23 show the effects of proper back wall protection and exposure. We see no damage whatever in Fig. 22, upper left and right. The back stucco wall and large roof overhang with westerly exposure giving full protection. Fig. 22 lower left, with direct north exposure results in total loss. Partial damage will occur where exposed to the north wind, however small, as in Fig. 22, lower right. A highly elevated, well mulched bed is seen in Fig. 23 left. This bed, totally exposed, suffered heavy damage. Back wall protection is exemplified in Fig. 23, right. The south wall of garage gave 100% protection.

Many will say, "Conditions are such in my yard I cannot protect from the north winds." In such cases it is very convenient to dig and store the bulbs during the winter months. This is an old practice which has been going on for years by many hobbyists. About November 1st, or before danger of freeze, dig all bulbs, wash and cut old foliage. Disinfect and let bulbs dry about one week, then place bulbs in pasteboard cartons. Fill cartons to a depth of ½ to 1 inch with horticultural Perlite, lay bulbs on Perlite, then cover with Perlite. Bulbs may be stored easily and kept in good condition. The cartons must then be kept in some protected location where temperatures will range from 50 to 60 degrees. March 1st, or after danger of frost, bulbs are again planted. You will experience normal bloom. The bulbs will root well and you will find the rest did them good. There is another advantage in this. We all know *Amaryllis* are heavy feeders. By stripping the beds

we have an excellent opportunity to work the soil and add missing ingredients during winter months.

Potted *Amaryllis* stored for winter rest should be placed in locations where temperatures will not go below freezing—80 Dutch bulbs were stored in closed garage. All bulbs froze. No heat was provided.

Fig. 22. Effects of January 1962 freeze on Amaryllis, New Orleans Area—upper left & right, no frost damage. Lower left, north exposure, total loss. Lower right, partial damage. See text for further explanation. Photos by W. J. Perrin.

Fig. 23. Effects of January 1962 freeze on Amaryllis, New Orleans Area—Left, well-mulched highly elevated bed fully exposed suffered heavy damage. Right, south wall of garage gave full protection and no damage was suffered. See text for further explanation. Photos by W. J. Perrin.

WINTERING AMARYLLIS IN OPEN GROUND

WALTER R. LATAPIE, *New Orleans, Louisiana*

Most of our Dutch and American hybrid *Amaryllis* survived the three-day severe cold spell last winter, when the temperature went as low as 10° F., on January 10, 11, and 12, 1962.

Some of the beds that were saved had been mulched during the summer with sugar-cane bagasse and then in December a 6-inch layer of pine needles was scattered over the ground. However, there was one bed with only the bagasse mulch, where none of the bulbs suffered any damage, but this was in a Southern exposure.

The bulbs that were lost had been planted on the Northern side of the house, with only a little of the bagasse mulch left around them.

From my observation of other gardens throughout the city, the deeper the *Amaryllis* bulbs were planted, the better chance they had to survive the severe cold when no mulch was used.

Mulching *Amaryllis* beds is very helpful in New Orleans. In the summer it cuts down on the need for weeding, and it conserves moisture. In the winter it protects the bulbs against frost and cold.

Regarding other Amaryllids planted in the open ground, the following Crinums survived the 10° F.: 'Cecil Houdyshel,' 'Ellen Bosan-

quet,' *moorei*, and *americanum*. The cold did not affect the *Zephyranthes* and *Sprekelia*. Last Spring I planted some *Haemanthus multiflorus* about 2 inches deep. During the winter these bulbs had sunk down about 6 inches into the soil, which is probably why they survived. They sprouted during the month of May.

LESSONS FROM THE 1962 FREEZE

EDWARD F. AUTHEMENT, *Louisiana*

Amaryllis fanciers of the Gulf Coast area were caught in a record freeze in January 1962 which will be remembered for quite a long time. Our customary mild winter weather in New Orleans was far from mild. When the forecasters predicted temperatures down to 12 and 13 degrees F., there was skepticism because such low temperatures were unheard of except in weather records of 100 years ago. It is good news then that so many plants were saved in spite of these low temperatures. There is no doubt that if the freeze had continued 2 or 3 days longer, the damage to vegetation in this area would have been tripled.

In the New Orleans area, *Amaryllis* are grown in a fashion that makes them very vulnerable to low temperatures. Some are planted with 1/3 to ½ of the bulb out of the ground. The American clones are so prolific that sometimes the offsets force the mother bulb entirely out of the ground. In such a condition, the bulb is completely exposed to the elements. Under these conditions, a great number of *Amaryllis* bulbs were lost in the severe freeze.

Amaryllis bulbs planted in raised beds or even at ground level, can survive a severe freeze if properly mulched. Hay, processed sugar cane fibers ("Serval"), grass clippings, peat moss, or any suitable material can be used to good advantage. If the freeze is prolonged, a layer of soil over the mulch gives a better protection. The labor involved in applying the mulch properly should be weighed against the surer method of lifting the bulbs and storing them till spring.

A sure method of saving potted *Amaryllis* bulbs from freezing, is the cold frame-saw dust arrangement. This is merely an enclosure with boards to accommodate any number of pots. One was built to take care of 65 7″ pots. It was intended to make unnecessary bringing the potted plants inside during mild freezes. The construction is of boards with the back about 4″ higher than the front. The top of the end boards is tapered to the front so that when window sashes are placed on top, a fairly neat fit is obtained. The enclosure was built to take four window sashes laid on top side by side. These were loose and could be removed at any time for ventilation. The 7″ pots were placed inside and sawdust was packed firmly between the pots up to the rim. As a precaution, DDT wettable powder was sprinkled generously over the pots and sawdust and watered thoroughly.

This arrangement was satisfactory for mild freezes which we are accustomed to. When the temperature dropped to the low 20s the first

day of the severe freeze, 30# felt was tacked all around the box. Two sheets of plastic film was then tacked on to the top of the box and the window sashes were placed on top of this. As an added precaution, a 100-watt light was placed inside and left on throughout the freeze. The success of this arrangement was proved when only the leaf of a small offset froze. This leaf had been resting against the boards on the north side of the box. The foliage, sawdust, and pot soil never froze.

It was also noted that bulbs planted with 2" or 3" of soil above the neck, were not damaged. Some of the bulbs planted with part of the bulb above the soil, suffered damage to the outer scales. The stem was not damaged and these bulbs are now growing back. In some cases, the stem froze and left the scales and basal plate in fair condition. It was found that these bulbs could be cored and replanted. These cored bulbs produced a fair number of offsets. Cored bulbs are those that have a round hole through the center of the bulb and the basal plate—a rim of the basal plate is left on for new roots to form on. Bulblets will be formed on the inside of this rim. The bulb is planted in the usual manner and a wide-mouth jar is placed over the bulb. This keeps the water from getting inside the bulb. When leaves from the bulblets are seen growing out of the neck of the bulb, the jar is removed. This method can be used with uninjured and damaged bulbs.

The blooms which followed in the spring from bulbs apparently not damaged by the freeze, were not quite up to expectation. Some were twisted or deformed to some extent. Others were small and did not last very long.

Reports from growers and personal experience showed that the seeds did not fully mature. Only about 1/3 to ½ of the seeds were fertile. Of those that were good and planted, germination was only about 50%.

So, at the expense of some high priced Amaryllis bulbs, we gained knowledge about freeze damage that may be very valuable in the future.

ADAPTABILITY OF HYBRID AMARYLLIS

Mrs. A. C. Pickard, *Houston, Texas*

The never-to-be-forgotten freeze of January 1962 took its toll in the blooms of Dutch hybrid *Amaryllis*. The freezing of so many of the buds, leaving only a small percentage of a normal season of bloom was quite a catastrophe in ways other than just loss of bloom. It cancelled Amaryllis shows, as all gardens were damaged to the same degree. Newly acquired or recently transplanted *Amaryllis* were also damaged to the extent of bulb deterioration. The bloom of the lesser damaged bulbs were below average in quality. The scapes were crooked, with flowers of poor form and colors hardly recognizable for the clone. The damage to foliage varied. It seemed to depend how far it had progressed.

The Amaryllis growers that made provisions as to protection with a heavy mulch found with Spring weather, a lush comeback of a great

percentage of the bulbs. It seems that a beautiful crop of offsets are in the making from the basal plates of damaged bulbs. This record breaking freeze put the *Amaryllis* Dutch hybrid in the front for endurance and tolerance of abnormal weather conditions in the Gulf Coast area.

The chief difference between garden *Amaryllis* of today and those of a generation ago is that most modern ones are of the hybrid origin and have been worked into a flower more beautiful and more adaptable. From the hybridizers gardens it is a safe forecast that new frontiers are still ahead in the work with these flowers, unlocking new treasures of form and color to bring distinction and richness to gardens and homes.

There might be something of value to be gained by studying the performance of seedlings grown and developed within the area, as to their tolerance of climatic conditions.

To the many new hybridizers, my advice, based on past experience is to select carefully the varieties you wish to cross. They should have clear color, good texture, pleasing form and sturdy scapes. I have found it most helpful to walk along the garden path when the *Amaryllis* blooming season starts and with a "seeing eye" look for color, form and substance. Later in the day I make a return trip to see how those stood the test of rain, sun and wind and find it quite helpful to have a critical eye for marking the outstanding clones. These are saved for future observation until the final decision.

A hybridizer should not be in a hurry to name and introduce a new seedling that at the moment seems perfect. It should be tested for at least two years, so that one can observe the actual color and size. Seedlings should be compared to see if it is really different in color and is well behaved according to number of blooms per scape.

In looking back over my hybridizing it seems as if I have been reasonably successful in carrying out my theories of breeding. However, there have been disappointments but there is no thrill quite equal to seeing a beautiful seedling unfold and show that you have helped to create a new and beautiful flower for others to enjoy with you.

The basic policies, upon which the "Houston Amaryllis Society" (affiliated branch of the American Amaryllis Society) was organized in 1957, are to develop a greater knowledge of "knowing, "growing," "showing" and "sharing." This has been demonstrated by the rapid strides of varied activities that have been made in the Society.

We have those who strive to show the best garden display. Others make the best arrangements. Then, there are those who work all winter planning crosses on paper and then—come Spring—rush out each morning to beat the bees to gather pollen. They also spend some time looking and comparing blooms of seedlings to see if the plants merit further watching or the compost heap. These are some of the individual activities that occupy our time.

Our most important service to Amaryllisarians is to assist the show chairmen in proper classification and regulations for judging Official

Amaryllis Shows in order to insure fairness of competition in a maximum of classes. We also compile show schedules and supply official judges. We advise clubs and horticultural organizations on various aspects of culture and propagation of *Amaryllis*

The services are available to all Amaryllisarians and the membership continues to lend assistance and promote the highest standards far beyond the realm of Society Membership.

ZERO WEATHER AND AMARYLLID SURVIVAL

CLAUDE W. DAVIS, *Baton Rouge, La.*

During the period of January 9th to 12th, 1962, the Lower Mississippi Valley experienced the coldest spell of weather of record for the past fifty years. For four successive nights the temperature at Baton Rouge, Louisiana was 10° F., with daytime temperatures never getting above 20° F. Night temperatures at New Orleans were down to 12° F., and North Louisiana and North Mississippi had near zero weather.

Gardeners generally were unprepared for such severe cold in an area where the winters are normally mild and as a result losses of tender and half-hardy plants were heavy. This was especially true of the Dutch Hybrid *Amaryllis* which were being grown in the open ground with the bulbs partially exposed. All forms of seedling Amaryllids and mature bulbs which were left outside in pots and flats were killed completely. This included seedling *Amaryllis, Zephyranthes, Habranthus* and *Crytanthus*, all of which were a complete loss.

There is a brighter side to the picture, however, because from this experience we learned something which will be of value in the future. The most important is that hybrid *Amaryllis* growing in the open ground were not injured where the bulbs were completely covered with soil up to the neck of the bulb and the bed was then mulched with leaves, straw or sugarcane bagasse which kept the ground from freezing. Growers in Shreveport and in Ferriday, Louisiana report carrying their *Amaryllis* through zero weather under these conditions.

In the garden at Baton Rouge established plantings of Crinums, *Hymenocallis, Zephyranthes*, and *Crinodonna corsii* survived 10 degree weather in the open ground without damage, but a report from Ferriday, Louisiana indicates that the various forms of *Zephyranthes* were killed by zero weather, whereas the Crinums survived this much cold.

Habranthus robustus came through the cold in Baton Rouge with a light mulch of bagasse around the plants, but mature bulbs of *H. brachyandrus* and the hybrid, *H. x floryi* were killed even though partially protected by a mulch around the plants.

NOTES ON AMARYLLIDS IN MICHIGAN, 1962

DONNA N. SCHUMANN

After four summers of growing Amaryllids in Michigan we now feel that while most of our various species can be grown here some are

more successful than others and we should plan our future plantings accordingly.

For our first attempts at growing our plants in this new climate we planted them in full sun with a southern exposure. The results were described in Herbertia, 1961. Since then we have varied the locations and found that a garden area that is shaded by an adjacent woods all morning with increasing sun exposure through the afternoon has been most favorable for our species. Soil moisture has probably been an important factor in this area since it does not dry out as quickly after rains or waterings as the area in full sun.

Zephyranthes citrina, *Z. brazosensis*, *Z.* sp. (Clint; "Valles"), *Habranthus robustus*, and, especially, *Z. smallii* have improved markedly in the new area. They have all multiplied nicely and have bloomed repeatedly from the time of planting in early May throughout the summer.

Z. sp. (Clint M-375), *Z.* sp. (Clint M-292) and *Z. grandiflora* have done equally well in both the full sun and the shade-sun areas. In fact *Z. grandiflora* has been the most rewarding of the small bulbs and has maintained nearly continuous bloom.

Habranthus brachyandrus, Z. insularum, Z. macrosiphon, and Z. drummondii have been very reluctant to bloom although the foliage growth appears good. *H. cardenasiana* has completely failed to blossom in the new area although it did in the full sun area. Perhaps a modification of the full sun area would improve the blooming qualities of the above plants.

Chlidanthus fragrans and *Z.* x *ruthiae clone* 'Ruth Page' have proved to be enigmas. Their foliage is excellent. They have multiplied many times their original number. But they won't bloom. I fear they must be considered unsuitable for growing in Michigan.

The larger bulbs of the *Hymenocallis* (subg. Ismene), Sprekelias and Crinums have continued to put on their lovely displays. They have all proved to be fine garden flowers regardless of where they are planted. They have not suffered in the slightest from the long winter storage to which they are necessarily subjected.

Crinum clone 'Cecil Houdyshel' and *Crinum* x *powellii* var. *album* have survived three winters next to the house foundation and are now of tremendous size. This summer 'Cecil Houdyshel' rewarded us with *four* stalks of lovely pink flowers and *C. powellii* var. *album* produced three stalks of its white flowers. Since these plants have been so unexpectedly successful we have now planted *C. kirkii* and *C. erubescens* and will try a hardiness test on them this winter.

The only small amaryllid to survive a hardiness test was a clump of *Z. candida* which was also planted next to the house foundation. A similar clump planted away from the house in an open garden failed.

A *Brunsvigia rosea* (Cape Belladonna) bulb which was planted next to the Crinums last summer survived the winter but has to date failed to flower. It will be left in place and tried again through another winter.

Rhodophiala is known to be somewhat hardy so we were especially pleased to receive some seeds from Dr. Traub so that we might try them in our climate. We have a pot of them growing now and they will probably be ready for a permanent garden location by next summer with a hardiness test following in the winter 1963.

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THE 1961-1962 AMARYLLIS SEASON

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The 1961-62 season was marked by the most severe cold spell in the deep south in many years. Most of the Gulf states were seriously hit by a cold wave that lasted several days with temperatures well below freezing. Many reported that they lost large numbers of bulbs and some even lost their entire collections. Many placed their potted plants in closed frames or in their garages which normally provided protection. The cold lingered long enough so that this protection was inadequate. When the cold weather was over many of the potted amaryllis were frozen. Bulbs in the open that were mulched came through in good condition but where they were not protected many were lost.

Peninsular Florida escaped most of the cold. The only apparent damage was a reduction in flower spikes. In the northern section of the state the scarlet *Amaryllis belladonna* (species) made only an occasional bloom this season. Damage in Texas was so great that some shows were canceled and even in Brownsville severe damage was reported.

The interest in amaryllis has not waned and many started making plans to rebuild their collections practically before the weather cleared. As these collections are rebuilt it appears we may be entering a new era in amaryllis culture. Many are replacing their border plants with the Dutch, Tunia's Australian, Tunia's X Dutch and other improved strains. This should stimulate more interest in amaryllis as these better hybrids are seen by the public.

The ardent show exhibitor is being more discriminating and is trying to be very careful to replace with only the truly good named clones. Some are buying only the newer clones; others are purchasing several of the older tried and truly worthy ones. Many have learned that it is better to have several of a good clone than many of those that are not reliable bloomers. The Dutch strain is still most popular but others like the African strains are gaining in popularity and surely will compete with the Dutch hybrids in the future.

As the quality of our garden clones improves, greater interest in exhibiting will surely take place and there should be rapid improvement in the number and quality of unnamed hybrids at the shows. The general public should increasingly be encouraged to participate in the

shows. Greater participation will expand interest and generally promote improvement in the clones offered to the public.

There is one thing I would like to suggest to those rebuilding their collections. Do not get over enthusiastic about the new ones even if you can afford it. There are a number of older clones that will be with us long after some of the new ones are forgotten. The true evaluation of a clone can not be made for several years. Do not get the idea that I am saying all new clones are not worthy for only in the new ones can we look for improvement. We surely need to purchase the new ones to encourage the hybridizers. My point is, don't overlook those clones you know are good just to buy something new. It is better to purchase three or four bulbs of a good clone than just sheer numbers of clones. It is always exciting to grow new clones and I am sure most of us can hardly wait to read the descriptions of the new ones each year. Opinions of the previous season are always welcome. By this means we often make up our minds for which of the new and higher priced introductions we will go overboard, and try next season.

Amaryllis appear to have an inherent weakness and one should understand this in judging new clones. Many clones grow vigorously until they reach maturity, make a wonderful or even spectacular display and then decline or become difficult to maintain in a flowering condition. You will note this among beds of seedlings and among your named clones. In certain cases possibly this one outburst of flowers may justify purchasing bulbs of certain ones. There are a few clones, I feel sure, that after reaching maturity you might as well cut up and start new plants. The young plants from such cuttage will grow vigorously to maturity only to decline again after flowering one or two seasons. I am sure you have observed this but many do not want to recognize it and want to blame their failures with these clones on some cultural defect. I do not mean to say that every clone that fails has this characteristic for there are many pitfalls in the culture that contribute to poor flowering.

The two most exciting newer varieties of the past season appear to have been 'Rilona' and 'Pink Beauty.' 'Rilona,' a light salmon bell with very dainty ruffling in the throat, is different, beautiful and appears extremely vigorous. Even the bulbs are beautiful to me being very uniform. It should become a leading variety and is the first one to challenge 'Bouquet' for first place among the salmon colored ones. You will surely hear more about this variety. 'Pink Beauty' is more a novelty in white flushed pink. The petals are so wide the flower appears double. It made many friends and will be extremely popular this coming season.

In commenting on the previous season one can not omit making remarks about the older clones; however, my main purpose is to comment on the newer ones and if I forget to mention one of your favorites forgive me for I can not in this small space evaluate all varieties. This year I would like to comment on the varieties by color and shade as I get many requests for this or that shade and this may help some in determining the particular shade you may be seeking.

WHITE CLONES

The whites are always popular having many old and worthwhile varieties among them such as 'Maria Goretti,' 'Ludwig's Dazzler,' 'White Christmas' and 'Queen of the Whites.' These and others are still popular and worthy. Another older one I fall in love with each time I see it flower is 'Mount Tacoma.' It has an ivory cream color that sets it aside from others. I may be unduly fascinated by this variety but I do feel it deserves your attention. Most whites can not be distinguished from another unless you read the name tag on it but 'Mount Tacoma' is an individual. Ludwig's 'Christmas Gift' is a fine standard late variety and 'White Favorite' gains in popularity each year. Warmenhoven's new variety, 'Oasis' (Snow Queen) is acclaimed by many as the top white. It is large and performs well and is worth watching. Warmenhoven's 'Mount Blanc' is a large ruffled white clone that will become more popular now that it is more reasonably priced. Van Meeuwen's 'White Christmas' gains in popularity each season and their new clone as yet unnamed was made available to a few this past season. It was well received and appears to be free flowering. Being fragrant it will become very popular. 'White Crane,'' another new tall white, is large and robust and will make its self felt at the shows. It is a good performer and will surely become popular. Only a few bulbs were available this past season and it will be scarce for a number of years.

Of all the whites to date 'Maria Goretti' has possibly the best reputation. It is a good shipper, fairly easy to flower, is fragrant and just a good all around variety. It also sets seed and many others do not. Many that hybridize often write that this or that one will not set seed. You will find the following varieties set seed easily: 'Maria Goretti,' 'Christmas Gift,' 'Nivalis,' and 'Leading Lady.' These should not fail you.

WHITES WITH COLOR

A fleck of color or a faint penciling, in my opinion, lends character to the white flower. Two in this class, Ludwig's 'Peppermint' and Warmenhoven's 'Marion' are available. Van Meeuwen expects to introduce a third, 'Siren,' in a few years. 'Peppermint' was liked by many but some complained of too much color. 'Marion,' a very large ruffled one with faint penciling, was well accepted. As light has a great deal to do with the amount of color in this type flower the grower will have to find which one does best in his area. An ideal clone with just the right amount of color will surely be developed. Mr. Rice of Valdosta, Georgia, has many seedlings of this type that are excellent. Possibly some day he will be able to offer named clones.

WHITE FLUSHED

'Apple Blossom'' is the indisputable leader in this class and this year became the most popular amaryllis in the world without a doubt. It is a wonderful variety and one that will be around for many years. 'Love's Desire' is beautiful and has more pink in it. It gains popularity

each year and is a vigorous free flowering variety. Both clones give excellent results from small sized bulbs and make beautiful border plants in the south. 'Pink Beauty' is a new sensation in this color. Its petals are so wide it appears double. It has good color and will become popular. 'Floridade' is much lighter and needs quite a bit of shade to give it the white blush pink color that is so popular. It is large and very beautiful when well grown. 'Little Diamond' possibly belongs here also and is really more of a pin stripe pink and white that appears pink. It is very large and has that perfect round flat flower. It possibly has the best color and form of any pink amaryllis. 'Golden Triumphator' is much like 'Floriade' except for the color being in a beautiful golden orange on white. This one also takes shade for best coloring. It is extremely large and under proper cultural conditions is exquisite.

PICOTEE TYPES

The picotees introduced by Ludwig & Co. are very popular. With the introduction of the named clones 'Dutch Doll' and 'Square Dance,' this type should become even more popular. The picotee type is relatively free flowering, has a loose airy form and is most artistic. They are without a doubt one of the most beautiful forms of amaryllis and especially deserve your attention.

WHITE STRIPED

The leading show clone in this color is 'Zenith.' It is extremely popular in the Texas area and often takes the best in the show. 'Silver Lining' is large and very popular in the Mobile area. More in this color are needed; however this has never been a popular color. Considering this it goes without saying that 'Zenith' can be spectacular to win best in the show with this handicap.

BICOLORS

'Beacon' is the only salmon pink and white. It is large and an exceptionally nice clone. 'Verona' similar in salmon orange and white is a very nice addition. It has a clean appearance and grows rather vigorously. 'Candy Cane' still remains popular with many. 'Fantasy' still ranks among the best in rose and white. 'Royal Dutch' with similar color was introduced last season. 'Five Star General' is a very handsome clone when grown well but appears to have cultural difficulties that may eventually eliminate it. Van Meeuwen's Rostenlii in red and white is prized by quite a few. It apparently is becoming more popular each year but is still not extensively known.

BLENDS

'Sweet Seventeen' and 'Pinksterflower' are possibly the leaders of this type. 'Sweet Seventeen' is a beautiful large shrimp pink. 'Pinksterflower' is similar in form but more in the orange tone (referred to as Azalea pink) and is a most robust plant that does well in the border in the south. 'Floriade', 'Golden Triumphator' and 'Little Diamond' might be included, however they were discussed under the white flushed varieties.

ROSE PINKS

Possibly the lightest in color is 'Flora Queen'. It is a beautiful soft light rose pink with slightly lavender caste. It is very scarce and is much in demand and is a truly beautiful clone. 'Daintiness' is still liked by many—a light rose pink with green throat. It is large, round and a good grower. 'Sight Show', new last year, has nice coloring but appears to be less robust. In the medium rose pinks 'Queen of Sheba' is becoming very popular. It has a lavender cast that many like, is large and grows vigorously. Ludwig's 'Pink Favorite' and 'Pink 'Perfection' still remain popular.

ROSE REDS

'Bella Vista', a medium rose red, is a strong contender for the ranking place. It has good color, size and grows very vigorously. 'Queen of the Pinks', 'Doris Lilian' and 'Diamond' are also popular. 'Elvira Armayo' is a large flowering clone with a lavender-purple caste. It is becoming very popular as many rave about its color. 'Violetta' still remains popular with some collectors as it has that classic round flat form.

In the darker rose red color the Warmenhoven varieties 'Moreno', 'Mysterie' and 'Bordeaux' pretty well dominate this color. Bordeaux is the darker. All have fine coloring. 'Beau Jolais,' a small flowering clone, has beautiful coloring. It is a most worth while plant and one that more should try.

WINE REDS

'Red Master' still leads this class and is still one of the most popular amaryllis being second only to 'Apple Blossom'. 'Mohawk' appears to be as large though it may be a little lighter in color. It makes 4 flowers per spike whereas 'Red Master' seldom makes more than two. From one season's performance 'Mohawk' appears to be a challenger. 'Red Master' however has been popular for many years and will be one hard to displace. 'Blazing Star' is of similar form. The color is generally lighter but I consider it a contender in this color. It is a very worthy clone being large and beautiful. 'Tristan' still remains popular. 'Alcyone' is a fine clone with beautiful color but flowers are not as large as the others in this group.

PURPLISH-RED

Three amaryllis are generally considered in this group: 'Purple Queen', 'Charlemagne' and 'Superba'. Many make claims for 'Purple Queen' as the leader in this color. 'Charlemagne' is very similar and is becoming very popular. Now that 'Purple Queen' is more popularly priced these two clones will slug it out. Both are good plants. 'Superba' is small and generally darker under ideal conditions. It can be truly beautiful and its admirers will surely not give up pressing it for 1st place in this color. Some may consider 'Tristan', 'Alcyone' and 'Red

Master' in this color. Cultural conditions influence color a great deal and some will be much darker in one area than in another.

DARK REDS

This is a popular color and new clones are introduced each year as the search goes on for the truly black red. 'Queen Superiora' has been around for many years. It is one of those old classic dark reds that is still popular. It has some new contenders. 'Hades' and 'Rotterdam' are two clones that are very similar and are nice dark reds with a fiery sheen in their throats. Both are beautiful and exceptionally nice plants. 'Franklin Roosevelt' is very popular with many. 'Red Majesty' and 'Royal Ruby' are two other nice dark reds.

MEDIUM REDS

The medium reds include many popular ones. The most popular is 'Ludwig's Goliath'. It is a huge one and always scarce. One that is nearly as large but seldom seen is Warmenhoven's 'Red Champion,' a huge flower that is relatively easy to bloom. This is an old clone that is little known because of its high price. Now that the price has been reduced it will become better known and surely will become a leading show clone. 'Giant Goliath', another large one, is very popular in the north and is well liked by many. 'Wyndham Hayward,' 'Ludwig's Scarlet' and 'Scarlet Beauty' are other poplar reds in this shade.

LIGHT REDS

Few are available in this color. 'Red Emperor' is a nice bright red that makes new friends each year. This is a neglected color and one to which the hybridizers should give more attention.

ORANGE REDS

This is a color that is becoming more popular. 'Traffic Stop', 'King Gustav', 'Lucifer', 'Don Camillo', 'Cherokee' and 'Friendship' are among the more popular ones. 'Halley' is an easy growing burnt orange red.

ORANGES

Many of these may be classed orange red or salmon. The following appear orange to me and I like to think of them in such a group. 'Orange Wonder' is without a doubt the leader. Though high priced it out sells most other amaryllis and possibly is among the top five most popular amaryllis. It is a beautiful bright orange with a darker throat. The flower has exceptional form and the plant is a fine vigorous grower. Ludwig's 'Delilah' is a light orange and the only one in this particular color. It is a beautiful soft orange that makes a wonderful show flower or border plant in the south. You will find 'Delilah' an exceptionally faithful clone. 'Camellia' is a new beautiful salmon orange when flowered in full light; leaning to salmon if given a bit of shade. It is a worthy new clone. 'Salmonetta' is another free flowering amaryllis

and has beautiful dark green foliage. There are a number of other good ones in this group and all command their admirers.

SALMONS

'Bouquet' has been the leader in this class for a number of years. It is a truly beautiful clone of begonia pink with purple midrib. It is very vigorous and does well at the shows as well as being an excellent garden plant. 'Rilona' is a sensational new one in this color. It is a light salmon buff and apparently has everything; color, form and vigor. It is slightly ruffled and has a dainty ruffling in the throat. It will fast become a leading clone—a different shade from 'Bouquet'. Both will remain popular for many years. 'Queen's Page', 'Salmonea' are other popular clones in this color.

SPECIES

The species still command quite a bit of interest. Possibly the most noteworthy introduction this past season was one received as *Amaryllis cybister* from Brazil. At this writing the plants I have growing of this species are very vigorous and it appears from the different coloring in the leaves that there may be more than one color or type among them. Gathered at the same time was another species (unidentified). The foliage is lanceolate-elliptic. Both were gathered by an experienced collector using the habitat information in Dr. Traub's Manual. Both collections were found growing to a depth of as much as 6". I have written my collector asking him to furnish more information regarding these species and we plan another collection trip into the area in the near future.

Another form of *A. aulica* was received from Matto Grosso, Brazil this season which I numbered 11/62. This is the sixth form of *A. aulica* I have obtained from Brazil. Each is said to be for a different habitat and it will be interesting to see these flower. Species No. 1/59 flowered last season and I should have at least a dozen to flower this season in October. It is definitely in the *A. aulica* group and has very narrow tepalsegs—possibly it is variety *stenopetala*. All the *aulica* group grow well here. I have found a mixture of peat and perlite to be best. I mix a good portion of dolinite lime and bone meal in the potting mixture. They are planted several to a 6 or 7" pot. The largest bulbs are now 3" or more in diameter. I find planting several bulbs to a pot helps their environmental condition considerably. *A. aulica* appears to take temperatures down to freezing without losing foliage and grow best during cool weather. They usually go dormant in June or July and start growth again in September and usually flower in October.

Species are becoming more difficult and more expensive to obtain. This is possibly due to the unrest in the South American area.

NEXT SEASON

This coming season you will see many new clones. The first five named clones of the HDL-G (see Fig. 24) African strain will be in-

troduced. 'Rosaline', a new blend of brick pink and white, is a beautiful large flowered clone and a new color in amaryllis. 'Tangerine,' 'Orangedale' and 'Terro Cotta' are nice clear orange reds. These three are not quite as large as the average Dutch hybrids but are of very nice form and color. 'Ruby Glow' is a free flowering dark red with a ruby throat. It also is smaller than most Dutch but a clone that should make a fine pot plant. These are all raised from off sets so should make vigorous border plants in the south. Some clones on trial the first year have made as many as five offsets. These five clones to be introduced were picked from 20 tested last season. This coming season 10 additional clones will be tested. These will be in the white-flushed-pink and wine red colors. The best of these will be introduced next season. The HDL-G Company expects to eventually introduce a full line of colors in the named clones.

Van Meeuwen has released several new clones this coming season in very limited quantities; 'Aphrodite', deep red with white throat; 'Belinda', dark velvet red; 'Cupido,' salmon pink; 'Hellas', stone red; 'Minerva', white with red border; 'Mars', blood red; 'Parsifal', bright red; 'Rembrandt', blood red; 'Rose Mary', rose. The Van Meeuwen Company has made great improvement in their amaryllis and are widening the range of color considerably. In the past few years such clones as 'Camellia', 'Hades', 'Queen of Sheba', 'Rilona' and 'Zenith' have been introduced. This year's introductions, if of the same quality will surely be excellent additions.

W. S. Warmenhoven is not offering any new varieties this season. Their recent introductions: 'Floriade', 'Golden Triumphator', 'Little Diamond', 'Marion', 'Oasis', 'Pink Beauty', 'Rotterdam' and 'Sjoukji Dykstra' are worthwhile additions.

The firm of W. Warmenhoven & Zonen has split up. C. Warmenhoven is offering this firm's named clones and three new ones; 'Topscore', red; 'Apollo', orange red; 'Flamboyant', scarlet red. The prices of this strain have been reduced so more people will become familar with them. This is a very worthwhile strain.

Ludwig this season is offering six new varieties. Two picotee types, 'Dutch Doll' and 'Square Dance', will without a doubt be fine additions and most welcome. Two reds; 'Home Decorator', 'Poppy', red and 'Trixie', cherry red, are to be introduced. These two reds appear in particular shades that should be a fine addition. One new striped clone, 'Streaking Stripes', is being offered. The striped ones are picking up in popularity. Many will want to try this clone. 'Winter Carnival' is a new large white with a suggestion of yellow. New whites are always welcome.

Other clones from different growers are appearing. The Van Waveren clones are again being offered retail. They are offering many new ones unknown to the American market. 'Bon Ton', rose; 'Clown', striped; 'General Eisenhower', salmon; 'Kathleen Ferrier', white; 'Red

Fig. 24. Part of the Amaryllis field of Harry de Leeuw Company (HDL-G) in Transvaal, South Africa. Originators of a new strain; the first five named clones registered and introduced in 1962 by Robert D. Goedert, Box 6534, Jacksonville 5, Florida.

Lion', red; 'Royal Velvet', dark red; 'Salmonea', salmon and 'Scarlet Beauty' are some of their older clones of merit.

Other small growers are introducing their new and best named originations to the American market through American dealers. 'Mohawk' and 'White Crane' are two fine clones from one of these companies registered and introduced last season. From this same company comes another interesting novelty, 'Personality', an orange red and yellow striped variety. I have seen similar colored amaryllis from India and they are rather pretty and interesting. Many of these small companies want only to sell their very best clones on the American market. They feel the American customer is a very sophisticated buyer and that only by introducing worthy ones will they be accepted.

The absence of comment on the Boshoff-Mostert strain from South Africa is due to my lack of knowledge of these amaryllis; otherwise I would discuss them. These amaryllis have more than likely been picked by a little different standard than we are used to with the Dutch hybrids. It takes one some time to get used to new styles and it goes without saying that many of these clones will be welcomed by the American fancier. It is generally considered that this strain is a rather vigorous one.

[See Mrs. Seale's article on the Boshoff-Mostert strain in this issue of the Year Book.—*Ed.*]

Great progress is being made in hybridizing and new colors and forms are being introduced each year. Generally we are forgetting the smaller and medium size sorts as the larger ones are more spectacular show flowers. The smaller kinds are especially suitable for house plants and should become popular for this use. The show people would be of great help in popularizing this type if they would give them a more prominent place in the shows.

AN AMATEUR'S GROWING PAINS

Andrew H. Grubbs, *Washington*

My interest and experience with amaryllis goes back to a childhood in Minnesota and forward to the present day. Considering the foregoing statement, I ought to be a mine of amateur information on amaryllis, but strangely enough I did not have a single success with an *Amaryllis* until the year 1947. Before that I had only seen those old fashioned *Amaryllis*, that two or three times a year would push up a bud, and in time there would be pale orange or brick red flowers.

A neighbor woman had a clump of these relatively small bulbs growing in a large pot, and seeing my interest in these flowers would from time to time give me a cluster of bulbs cut from the edge of her pot full. They would grow well during spring, summer and fall only to succumb to freezing at some time during the cold winter nights, when wood fires would get too low or go out, as they sometimes did. I then tried growing them during the warmer weather and wintering them in the vegetable cellar. Why they did not bloom with this treatment, I

do not know, unless the winters were too long or they didn't survive long enough without mishap to become of flowering size.

It was some years later, in 1947, that I chanced upon just one huge *Amaryllis* bulb in a store in Missoula, Montana. Its price was fifteen cents. It was spring time and I was planting a flower garden, and so I bought the bulb and planted it in my garden. Here I made a mistake right at the start. I planted it deeply, well below the surface of the ground. I waited, not too patiently, for it to come up, when I thought it should be up I would dig down until I could see the top of the bulb, I would feel that the bulb was still firm and I would cover it again and after a couple of weeks would repeat the performance. Cold weather came in the fall and I dug the bulb and found it exactly as it was when it was planted. Not even a root had formed. Disgustedly I rolled the bulb in a thick tube of newspapers, pinned the ends shut and stored it in a warm closet. I do not know how long it was before I thought of the bulb again. When I did and unrolled the paper I was amazed to find that the bulb had long foliage and a fully developed flower scape on which were the remains of the withered flowers. I potted the bulb and fortune smiled upon me. It sent up another scape and flowered beautifully. The flowers were larger than any I had seen and were white striped with red. I thought to myself, surely these are something new in *Amaryllis*. Perhaps a mutation or a sport. Imagine my surprise when I began telling people about my unusual *Amaryllis* only to learn that that was the only kind they had ever seen. They were then more common than the old orange ones of my childhood.

Noticing the large pistil of this amaryllis and the copious supply of pollen, I pollinated it with its own pollen. It produced a large, healthy seed pod. When the pod opened and I saw the hundreds of tissue paper thin seeds I thought there was not body enough to them to contain a viable embryo and were therefore too immature to grow, however I took the seeds with me and left the bulb behind when I left Missoula.

Some months later, I planted the seeds and was surprised at the large number of seedlings and their rapid growth. This pleasing experience started me to seeking more information about *Amaryllis* and the colors that were available.

My next bulb was given to me by a friend in Minneapolis. It had not bloomed for her but she said that the person, who gave it to her, told her that it was not an *Amaryllis* being greenish white and more beautiful than an *Amaryllis*. When it bloomed it was just like the Missoula bulb. My seedlings were also like their parent.

The third bulb added to the collection was scarlet red with faint stripes of a slightly different shade. This I assume to be one of the bulbs sold as the Meade strain. Later I bought three bulbs advertised as the famous Meade strain and the three of them were very similar to bulb number three.

Bulbs #2 and #3 were crossed both ways and all of the resultant seedlings were reds very similar to each other. The next find was a

red Dutch hybrid called a Royal Dutch, though not named. When it bloomed, it was indeed a fine flower and I thought at the time that probably no better and not much different ones could be found. An answer to an advertisement brought me Mr. Houdyshel's catalog and the subsequent purchase of the two named clones, 'Violetta' and 'Moreno', dispelled this notion as well as the one about the prices of top quality imported bulbs. This catalog also made me aware of the American Amaryllis Society which is affiliated with the American Plant Life Society.

After I had received two issues of Herbertia and purchased Dr. Traub's Amaryllis Manual I fully realized the magnitude of the subject of *Amaryllis* and my limitations. Any hope of ever being more than a good amateur grower and breeder of just some of the members of the very large family quietly faded away. Be this as it may, there still remains the educational and cultural values of the pursuit. Some of these values are acquired by searching for information as one tries to grow with his hobby or avocation. Some of the interesting bits of knowledge consist of facts from geography, science, photography, soil management, and the like.

When a small greenhouse was added to our garden, I had visions of its being full of bright blooming plants the year around. This could not work with the kinds of plants I wanted because always part of the plants were dormant, part not ready to bloom and some just being started and all of them had to be housed at proper temperatures. It seems to me that at least three greenhouses or one with three separated parts would be needed for the collection I had, but it is certain that a large part of my troubles could be a lack of know-how.

My first collection consisted largely of gloxinias and they did very well but I was not satisfied because the plants were very large and I could not have as many as I wanted. Also as soon as hot weather came the blossoms were ruined by excessive heat.

Along with the gloxinias I had the several *Amaryllis* that I have already discussed. Their blooming was over before hot weather set in and the heat in no way prevented them from growing luxuriant foliage during the summer. Upon the basis of this, I conceived the idea that I still might achieve my original desire for continuous bloom by collecting only within the huge order of amaryllids, and so I began adding these, hoping that their needs would be nearly the same as those of *Amaryllis.* I knew nothing about most of these bulbs and selected them from book and catalog descriptions. Needless to say many of them were a disappointment. I bought more named Dutch *Amaryllis*, some species, American hybrid amaryllis, Oriental strains, Belladonnas and then for variety I added *Vallota*, *Nerine*, *Lycoris*, *Clivia*, *Eucharis*, *Hymenocallis*, *Agapanthus*, *Zephyranthes*, *Habranthus*, and crinums, as well as some others.

I feel sure that most of the readers of Herbertia already know that I did not achieve my goal. I will tell briefly what happened and perchance some experienced grower of these plants will write, in some

future issue of Herbertia, more specific directions for their culture, than a catalog gives.

There is no reason for me to complain about the performance of the hybrid *Amaryllis*. Good cultural directions were available for them and they grew perfectly from the beginning, and each year since have made a splendid display. Many people come each year to see them when they are in bloom.

Clivia miniata grows well, blooms and is beautiful enough with about the same culture as *Amaryllis* except it has no dormant period. *Clivia* has the following disadvantages as a plant for small greenhouse. It requires a very large container and therefore takes more room than one can afford to give to it. It had scale insects when it came from the nursery and any treatment for them that I have found leaves the plant spotted and disfigured.

Sprekelia formossissima superba bloomed once in January and this last season in June. The catalog described this plant as evergreen, however I believe that it requires almost complete dormancy to bloom. I have only had blooms twice out of six years. It is a beautiful and interesting plant when in bloom. During the rest of the year its ragged, shaggy appearance does nothing for the appearance of the plant collection. I pollinated *Sprekelia* with pollen from an *Amaryllis* and got a seed pod but the seeds were shriveled and sterile.

Agapanthus longispathus rates about the same as *Sprekelia* though it is not as strikingly beautiful as sprekelia. It blooms once each year and its foliage is more erect and neat than that of *Sprekelia*. It thrives outside in the summer time. One other thing I can say in its favour is that the blooms last a much longer time. The larger *Agapanthus orientalis* (blue form), erroneously called Blue Lily of the Nile, grew well for a time but died before it bloomed. I know of no reason unless I used the watering can too generously. I often water too much during hot weather because I am away from home most of the time and get fearful, lest they dry up while I am gone.

Nerines—of these the catalog said, "The only reason more people do not grow nerines is, they do not know how easy they are." For me they are exceedingly contrary. Instead of growing and resting in the seasons specified by the books, they grow off and on in any season without rhyme or reason it seems. They have produced good foliage and multiplied until they are root bound, as the book says they should be to get blooms. They are now four or five years old and have yet to bloom. They have grown all of this past summer and now, in early October they are still growing. It was my impression that they were supposed to die back in late summer and bloom in the autumn.

Lycoris aurea did not respond at all to pot culture. I then tried them in the outside garden where they were destroyed by the *Narcissus* bulb fly. Since they are not hardy I doubt that they could be brought to bloom out-of-doors.

Lycoris squamigera was planted outside from the start. It grows weakly and has small weak blooms, which soon fade away in our hot

summer sun. Perhaps in a partial shade bed it would adapt itself to our climate.

Eucharis—that I haven't had success with this as yet is partly due to accidents and partly to unfamiliarity with its needs and habits. I still have a feeling that *Eucharis grandiflora* will be a desirable plant when I have mastered its culture. It grew well from the beginning and multiplied freely. I separated the bulbs and repotted them five to a pot. I kept them moist all the time, thinking that they would continue growing without resting but instead of doing that they all rotted except one bulb, which is now doing fine.

Amaryllis ambigua has grown at various times regardless of season. This year (1961) it has not begun to grow at all and it is now October. I repotted it during the past winter and let it remain dry until spring. When the weather got hot and it had not started growth I sank the pot in a shaded bed out of doors.

Brunsvigia rosea (Cape Belladonna) is often advertised as a good pot plant. Mine grew luxuriantly in the greenhouse, but never bloomed. Outside it neither grows well, nor blooms.

The *Crinum* 'Cecil Houdyshel' has proved hardy here and grows well but its flowers have been consistently very small and short lived. The plant is growing in full sun for two thirds of summer days and it is quite possible that our desert sun is too hot and the plant would do better in partial shade.

Hybrid *Amaryllis*—when one amaryllis blooms it is beautiful but when a large number of them are in bloom at the same time they are almost breathtaking in their beauty and one thinks of the Master's saying, "Not even Solomon in all his glory was arrayed like one of these".

Aside from their beauty when blooming, the thing that makes *Amaryllis* growing so intriguing is the ease with which they can be hybridized, leaving no doubt that a genuine cross has been made. I now have seedlings from 31 successful pollinizations. The first ten crosses have bloomed and each year there will be several new ones to look forward to. The first ones are all red but some variations are beginning to show up now.

Most of my crosses have American hybrids as the seed parents and Dutch hybrids as the pollen parents. The reason for this is that I used my first three Dutch hybrids to bear seed and they were so weakened that it took them several years to get strong enough to bloom again.

When I wish to cross two fine Dutch hybrids I pollinate one and when the bloom starts to fade or sometimes after the pod has begun to grow I cut the scape and place it in a jar of water or plant it in a pot of clean gravel or sand and keep it saturated with a "Hyponex" solution. Normal seed pods form and grow well for a time but usually before maturity the pods shrivel and the seeds are also immature and wrinkled but usually I can get three or more of these, out of a pod full, to germinate. The resultant seedlings are also weak but by carefully

[GRUBBS—AMATEUR'S GROWING PAINS, continued on page 81.]

SOME AMARYLLIS SEEDLING RECORDS

BURR CLOUETTE, *California*

In April 1962, 20 seeds of *Amaryllis calyptrata* were received from Mr. Quinn Buck. Germination started on April 22, and 15 seeds in all sprouted. By the end of 6 weeks from planting all of the seedlings had made the first leaf; the second leaf soon followed. By the end of July, the third leaf had formed. Each succeeding leaf was broader and longer, with the third and fourth leaves measuring ¼ inch wide, and 8 to 10 inches in length.

Fig. 25. Left, *Amaryllis calyptrata* seedlings five months from seed planting; Right, various Amaryllis seedlings. Snapshot by Burr Clouette.

On August 1, the seedlings were transplanted to 3-inch plastic pots. No setback was noted. At this writing (Sept. 15, 1962), all plants are growing well, and some of the bulbs are ½ inch in diameter (see Fig. 25).

The seeds had been planted on edge in "Black Magic Planting Mix", and were transplanted to the pots in the same mix. The seedlings were watered often enough to keep the soil moist, but not too wet. They have been fertilized with liquid fish solution at least every 10 days. Since transplanting outdoors, they were given part shade at first, but now are growing in full sun along the south facing wall. There they, and other *Amaryllis* require nearly daily watering.

I obtained 16 seedlings of *Amaryllis psittacina* from seeds given to me by Dr. Traub. At least 75 seedlings were obtained from a Peruvian

[CLOUETTE—AMARYLLIS RECORDS, continued on page 159.]

TRANSMISSION OF A VIRUS INCITING AMARYLLIS MOSAIC SYMPTOMS

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Virus-like symptoms in Amaryllidaceae have been observed in field- and greenhouse-grown plants by many amaryllid enthusiasts. Some growers have attributed these symptoms to nutritional imbalance, whereas others have implicated viruses. However, *observation* of virus-like symptoms *per se* does not constitute proof of virus infection because many virus-like symptoms may be of physiologic or genetic origin. Symptoms incited by virus are distinguished from those caused by physiologic and genetic factors by establishing the infectious nature of the virus on the basis of transmission tests.

The objective of this paper is to report positive transmission of a virus from *Amaryllis* to *Amaryllis* and from *Amaryllis* to tobacco to *Amaryllis* and thus establish that *Amaryllis* mosaic is caused by at least one virus. We also wish to show photographs of symptoms known to be incited by virus for reference by amaryllid growers and recommend control measures.

LITERATURE REVIEW

The scientific literature of amaryllid viruses was reviewed in 1942 by Hannibal (4), in 1948 by Brierley (2), in 1958 by Traub (12) and in 1960 by the senior author (7). These literature surveys revealed no reports of actual virus transmission from *Amaryllis* even though the *Amaryllis* mosaic disease has been known for at least 30 years. *Amaryllis* mosaic symptoms have been observed by many amaryllid growers, particularly under field conditions in the South. The pattern of spread of virus-like symptoms under field conditions suggested that an insect vector of a plant virus was involved. However, apparently no one had actually demonstrated transmissibility of an infectious agent from *Amaryllis* by isolating a virus from *Amaryllis* with symptoms and then transmitting this isolate back to healthy *Amaryllis.* Although an insect vector was suspected, none had been reported in the literature.

In 1959, Anderson (1) reported that "mottled *Amaryllis* sp. yielded CMV" (cucumber mosaic virus) in a survey of Florida weeds and cultivated plants that might act as reservoirs for pepper viruses. Although Anderson isolated Cucumber mosaic virus from *Amaryllis,* he did not report transfer of this isolate back to healthy *Amaryllis.*

Amaryllis mosaic disease (previously referred to as *Hippeastrum* mosaic) is not listed in 3 compilations of recognized virus diseases (5, 6, 11). Apparently, the failure in the past to report transmissibility of a virus was sufficient grounds for omission from these compilations even though virus-like symptoms of *Amaryllis* were frequently observed.

A virus, not associated with the mosaic symptoms, has been isolated from *Amaryllis* (3, 10). This virus, known as the tomato spotted wilt

virus, is transmitted by sap-transfer and by thrips.

METHODS AND MATERIALS

Virus source plants. The amaryllid source plants, i.e. plants with virus-like symptoms, from which leaves were detached for virus assay or indexing are listed in Table 1.

Table 1. Sources of Amaryllids with virus-like symptoms used in virus transmission tests.

Accession number	Genus and species	Collector	Location
700-705	**Amaryllis** hybrid	Eugene Griffith	Takoma Park, Md.
706-709	**Amaryllis** hybrid	William Preston	Glenn Dale, Md.
710-716	**Amaryllis** hybrid	Eugene Griffith	Takoma Park, Md.
717-720	**Amaryllis** hybrid	Curtis May	Beltsville, Md.
783	**Amaryllis evansiae** Traub & Nelson	Ira Nelson	Lafayette, La.
785	**Amaryllis** hybrid (detached leaves)	R. G. Greenler	Waukesha, Wis.
786-787	**Crinum macowanii** Baker, seedlings	H. P. Traub	La Jolla, Calif.
796-797	**Amaryllis** sp. (received as **Hippeastrum velutinum**)	Longwood Gardens	Kennett Square, Pa.
802	**Nerine flexuosa** (Jacq.) Herb. var. **alba**	Leo Brewer	Orinda, Calif.
803	**Narcissus** clone 'Grapefruit'	Leo Brewer	Orinda, Calif.
804	**Lycoris incarnata** comes ex Sprenger	Leo Brewer	Orinda, Calif.
805	**Brunsvigia rosea** (Lam.) Hann. var. **pallida**)	Leo Brewer	Orinda, Calif.
807-809	**Amaryllis** hybrid	A. H. Grubbs	Richland, Wash.
810-815	**Amaryllis** hybrids	P. N. Musgrave	Huntington, W. Va.

Indicator plants. Indicator plants, which are known by extensive testing to produce conspicuous symptoms when inoculated with a particular virus, were as follows: (1) *Amaryllis belladonna* L. seedlings or *Amaryllis* hybrid seedlings; (2) tobacco, *Nicotiana tabacum* L. 'Ky 35' 'Samsun'; (3) wild tobacco, *N. glutinosa* L.; (4) Jimson weed, *Datura stramonium* L.; (5) cowpea, *Vigna sinensis* (Torner) Savi 'Black'; (6) *Chenopodium amaranticolor* Coste & Reyn.; and (7) beans, *Phaseolus vulgaris* L. 'Pinto' and 'Refugee.' These indicators were utilized to ascertain whether the source plants were infected with a transmissible virus.

Greenhouse facilities. All source plants and indicator plants were grown in a greenhouse (Vegetables and Ornamentals Research Branch, Crops Research Division, U. S. Department of Agriculture) at Beltsville, Maryland. The greenhouse was heated in the winter (60 to 75°F) and cooled in the summer (usually less than 80-85°F). Plants were grown in a compost-soil mixture and fertilized with a complete soluble fertilizer when necessary. The greenhouse was fumigated once each week, usually with Parathion.

Mechanical transmission. Mechanical- or sap-transmission tests were conducted by standard virological procedures. Leaves from source plants were ground with a pestle in a mortar containing 1 percent potassium phosphate (K_2HPO_4) solution. The juice was then expressed through cheese cloth and then rubbed with cheese cloth pads on leaves of indicator plants which had been previously dusted with 600 mesh Carborundum. (Carborundum is believed to facilitate infection by pro-

viding microscopic wounds through which viruses enter plant cells). After inoculation, the plants were rinsed with water to remove excess plant juices that might cause direct injury.

Insect transmission. Insect transmission tests were conducted in the greenhouses of the Entomology Research Division, U. S. Department of Agriculture, Beltsville, Maryland. Approximately 25 non-viruliferous green peach aphids, *Myzus persicae* (Sulz.) (reared on collards) were starved for 2 hours and then placed in a small cage on an *Amaryllis* leaf showing virus-like symptoms. After a 10-minute feeding period on these leaves, the aphids were transferred with a camel's hair brush to indicator plants and allowed to feed for 30 minutes. Then the aphids were killed by immersing the indicator plants in nicotine sulfate. Finally, the indicator plants were returned to the greenhouse and observed for symptoms.

RESULTS

Transmission of a virus from Amaryllis. We have transmitted virus from amaryllid source plants to healthy *Amaryllis* seedlings, and also from amaryllids to tobacco and then to healthy *Amaryllis* seedlings by sap and aphid transmission. To our knowledge, this paper constitutes the first report of transmission from diseased *Amaryllis* to healthy *Amaryllis* of a virus that will incite *Amaryllis* mosaic symptoms.

Sap transmission. Symptoms were produced on virus-free Samsun tobacco plants and *Amaryllis* seedlings whose leaves were rubbed with the juice from amaryllid source plants that showed typical mosaic symptoms ranging from mild to severe. These tests, which were replicated 2 to 4 times for each source plant during 1960 and 1961, demonstrated that a virus was present. We have transmitted this virus from each of the following sources as listed in Table 1: 700-711, 713-720, 783 (Figure 26), 785, 799, and 807-809. In addition, we have transmitted virus from 802, 805, and 810 to tobacco but have not yet tested these sources on *Amaryllis*. We have not yet transmitted virus to *Amaryllis* seedlings on tobacco from the following source plants: 712, 786 (Figure 26), 787, 796, 797, 803, 804, and 811-815. However, we are in the process of repeating these tests.

Aphid transmission. A virus was transmitted by green peach aphids, *Myzus persicae*, from amaryllid or tobacco source plants to healthy tobacco *Amaryllis* seedlings. We have obtained aphid transmission from the following amaryllid source plants: 705, 713, 714, 716, 786, and 809. In addition, virus transmission occurred from source plants 703, 713, 714, 715 and 719 when the virus in amaryllid source plants was first transferred to tobacco by sap transfer methods and then the tobacco used as a source plant for aphid transmission tests. The other amaryllid source plants have not yet been tested by aphid transmission.

Seed transmission. The virus apparently was not transmitted through the seed to any of approximately 2000 *Amaryllis* seedlings grown from seed harvested from plants known to be virus-infected. None of the seedlings developed symptoms at the end of 2 to 2½ years

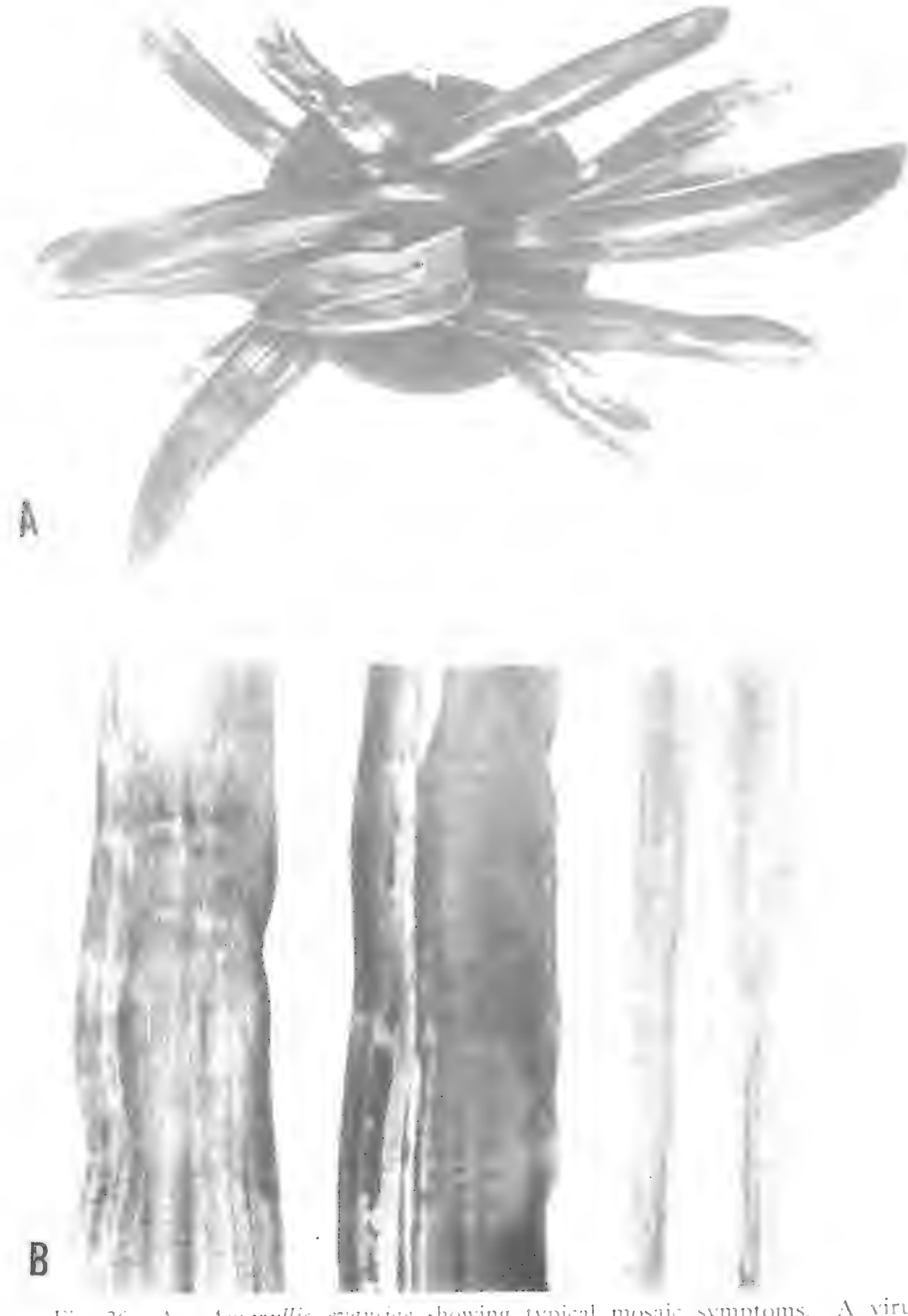

Fig. 26. A. *Amaryllis evansiae* showing typical mosaic symptoms. A virus was isolated from this plant that would incite symptoms on *Amaryllis* seedlings but not on tobacco. B. Detached leaves from *Crinum macowanii* showing virus-like symptoms. A virus has not yet been isolated from this source plant but the tests are currently being repeated.

under greenhouse conditions. To determine whether any latent strains of the virus might be present in a random sampling of symptomless seedlings, we used 20 symptomless seedlings as source plants in sap transfer tests. However, virus was not transmitted from the symptomless seedlings.

These tests, under controlled experimental conditions, demonstrate that the virus is apparently not seed-borne, and confirm reports in the literature (2, 7, 12) and experience of *Amaryllis* growers.

Identification of the Virus. The virus which was transmitted by sap transfer and by aphids was identified as the Cucumber mosaic virus (CMV) (*Marmor cucumeris* H). This identification was based on symptomology, thermal inactivation, dilution-end point, longevity *in vitro* determinations, and on the methods of transmission.

As far as symptoms are concerned, the amaryllis virus isolates that could be maintained in tobacco (701, 703, 713, 714, 715, 719, 785, 802, 805, 810) all incited the same symptoms as 3 type cultures of CMV (CMV-Y strain; CMV-1, Doolittle strain; and CMV-6, Price's indicator strain) on the following indicators:

Datura stramonium—mottle
Cowpea, primary leaves—pin-point reddish-brown necrotic local lesions.
'Samsun' and 'Ky 35' tobacco—vein-banding without necrosis on inoculated leaves followed by mosaic on newly formed leaves, occasionally white necrotic rings.
Nicotiana glutinosa—mosaic without necrosis
Chenopodium amaranticolor—systemic chloritic spotting
Beans—no symptoms
Amaryllis seedlings—mosaic or occasionally concentric chlorotic rings or line patterns followed by mosaic.

The *Amaryllis* isolates and known CMV cultures have similar characteristics as follows: (1) thermal-inactivation point (temperature which inactivates the virus during a 10-minute exposure of sap from infected plants in test-tubes immersed in a controlled temperature water bath), (2) dilution end-point (the greatest dilution of sap that will still retain infectivity), and (3) longevity *in vitro* (longest time period that the virus in plant sap remains infectious when stored at room temperature). The thermal inactivation point was between 60 and 65°C, the dilution end-point was in excess of 1:100,000 (1 volume of sap from infected plants in 100,000 volumes of water), and the longevity at room temperature (about 20°C) was 3 to 4 days.

The final characteristic upon which the identification of the virus was based was that both the *Amaryllis* isolates and known CMV isolates are sap- and aphid-transmitted. CMV has been reported by other investigators to be transmitted by several other species of aphids (11).

Symptoms. As we have pointed out, "observation" of virus-like symptoms does not constitute proof of virus infection. Nevertheless, most amaryllid growers do not have facilities to conduct sap-transfer or aphid-transmission tests to determine whether the symptoms in his plants are of virus origin. Consequently, the amaryllid grower must rely on visual observation. In doing so he may condemn plants with virus-like symptoms that may not actually be infected.

We have photographed *Amaryllis* mosaic symptoms from some amaryllid source plants listed in Table 1 (Figure 27). We have also photographed symptoms from healthy plants infected with the *Amaryllis* isolates and known sources of cucumber mosaic virus (Figure 28).

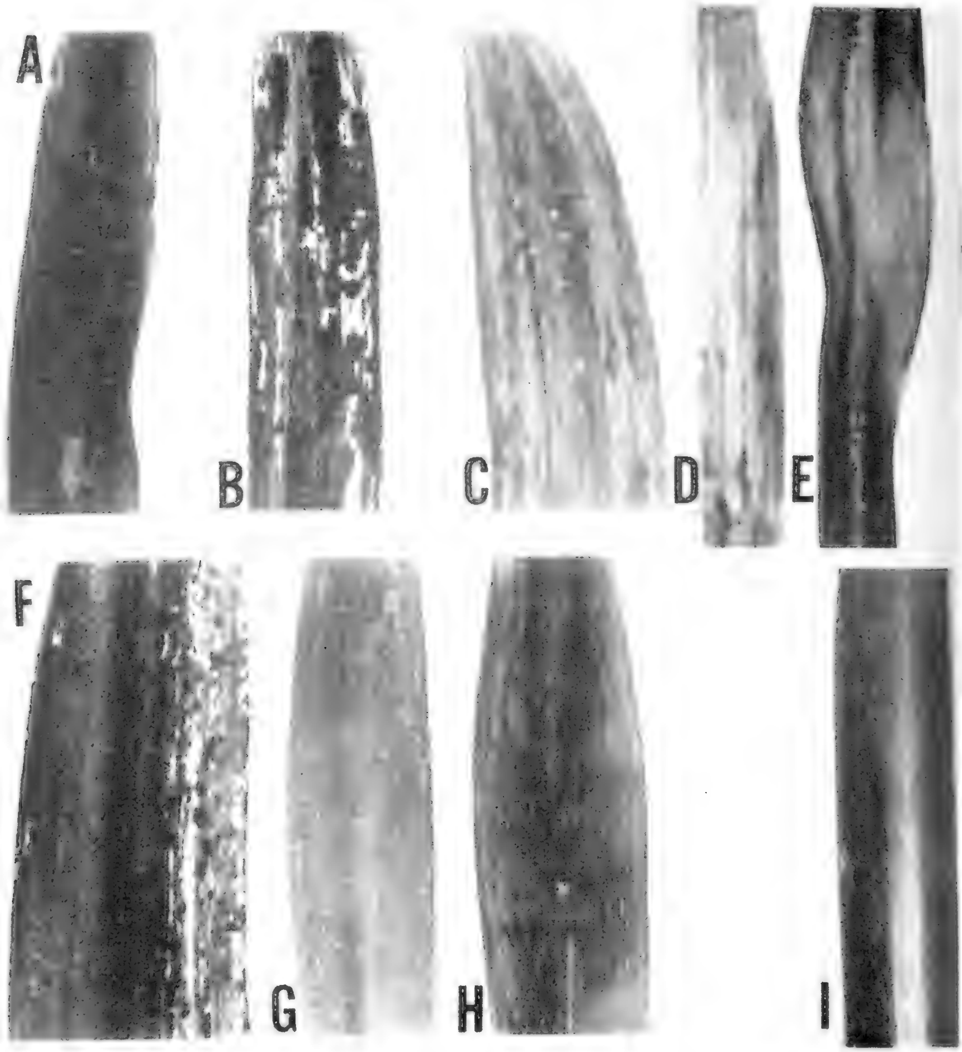

Fig. 27. A-H. Leaves from naturally infected *Amaryllis* source plants showing typical symptoms of Amaryllis mosaic. A virus was transmitted from each of these symptom types to *Amaryllis* and tobacco seedlings. I. Leaf from comparable healthy *Amaryllis* plant.

Amaryllis mosaic symptoms are characterized by light and dark green areas which may be scattered irregularly over the leaf. These

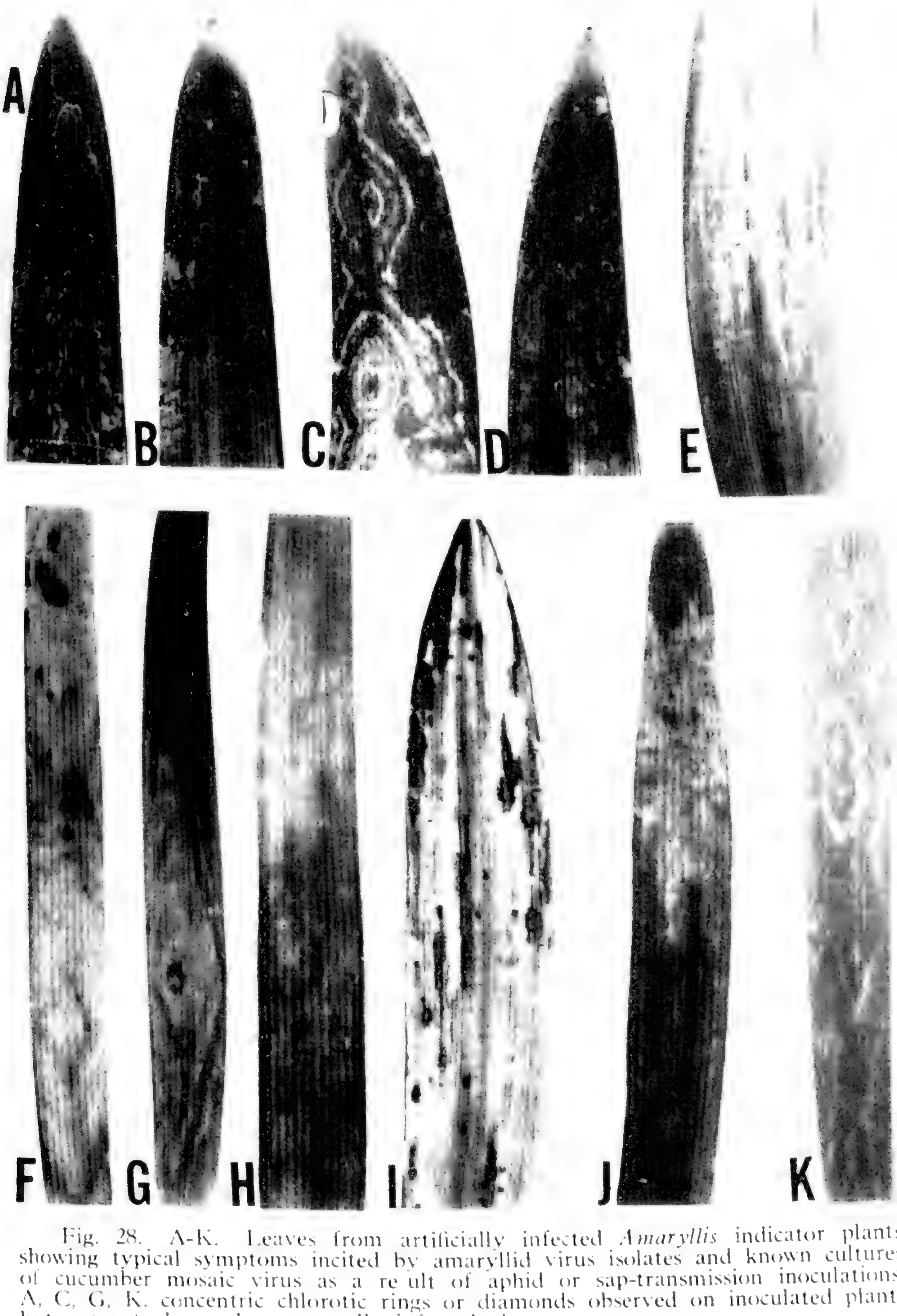

Fig. 28. A-K. Leaves from artificially infected *Amaryllis* indicator plants showing typical symptoms incited by amaryllid virus isolates and known cultures of cucumber mosaic virus as a re ult of aphid or sap-transmission inoculations. A, C, G, K. concentric chlorotic rings or diamonds observed on inoculated plants but not yet observed on naturally infected plants.

discolored areas may also consist of large patches of yellow-green, white, or pale-green stripes. In addition, when virus is inoculated into healthy *Amaryllis* seedlings, chlorotic concentric rings or diamonds, line pattern or "chevron" striping may be observed. In contrast, symptoms incited by the tomato spotted wilt virus (2, 3) consist of numerous yellow or white spots in association with necrotic or red spots on the leaves. These lesions may remain solitary or coalesce to form irregular areas scattered over the leaf. The leaves may turn yellow and die as a consequence of infection by the tomato spotted wilt virus.

We do not have photographs of symptoms that are known to be induced by nutritional deficiencies or excesses. However, since our source plants and indicators were grown under optimal conditions with respect to light, temperature, watering, soil and fertilizer, we are certain that symptoms shown here are not of physiologic origin. None of our non-inoculated *Amaryllis* control plants ever showed any type of symptom during the 3-year period in which we conducted our tests.

We are not in a position, on the basis of our experimental studies, to conclude that nutritional imbalance might not result in symptoms in some other *Amaryllis* plantings which would be similar to those we have presented for virus-induced symptoms. However, we are of the opinion that nutritional imbalance symptoms would be more likely to be expressed as general chlorosis, or as necrosis, reddening and chlorosis along tips, margins, or veins.

Similarly, we can not say that the symptoms which we have pictured may not, in some other plants, also be induced by a genetic factor. However, none of our non-inoculated seedlings (almost 2000) developed such symptoms.

Therefore, we are concluding that the photographs in this paper show symptoms of naturally infected plants from which a virus has been isolated or of plants artificially infected with *Amaryllis* virus or known cucumber mosaic virus isolates.

We are not in a position to state that *all* plants which produce symptoms similar to those we have photographed are virus-infected. However, it is our opinion that there is little likelihood that these symptoms are induced by nutritional or genetic factors. Consequently, for practical purposes in controlling the disease, we would advise amaryllid growers to consider all symptoms similar to those shown in the photographs as virus-induced.

Recommendations for Control. Control of virus diseases is generally directed towards preventing infection rather than curing a plant already infected. Chemicals that have been tested so far which would inactivate a virus already established in a plant have also been detrimental to the plant. Heat treatments (growing plants at 100-102° F for 30 to 90 days) have been effective for such plants as citrus, rose, chrysanthemum, and carnation in providing an environment where the virus does not keep pace with the growing point. Consequently, virus-free tip cuttings

may be propagated. However, the heat treatment does not cure the mother plant.

Since effective control measures must be based on preventing infection, they should be geared to preventing transmission from infected to healthy plants. We now know that a virus which incites *Amaryllis* mosaic is spread by sap transfer and by aphids.

Although we have used the sap transfer method experiment to prove the infectious nature of the causal agent, the amaryllid grower may unintentionally transmit virus by this method on his cutting implements. Sap-transmissible viruses are often spread on cutting knives if the virus attains a high concentration in the plant sap. We have not attempted to demonstrate transmission of an *Amaryllis* mosaic virus by knives or other implements. However, experience with other sap-transmissible viruses leads us to concur in the recommendations of Traub (12) for the sterilization of knives used in propagation by bulb cuttage, especially that such implements be sterilized if they have been used on bulbs with symptoms before use on symptomless plants. Sterilizing could be accomplished by any of the following methods: (1) dip the implements in alcohol and flame, (2) boil them for 5 minutes, (3) dip them in washing soda, trisodium phosphate, or in electric dishwashing compound and rinse in water (use of rubber gloves recommended), or (4) wash them in strong soap.

Destruction of infected plants has been recommended as the principal control measure (2, 7, 12). We would strongly concur with this recommendation since infected plants serve as a source of inoculum for spread by the aphid vector. Commercial growers should carefully rogue infected plants to prevent dissemination of virus in bulbs sold to the public. If *Amaryllis* collectors possess infected plants too valuable to destroy, these plants should be isolated from other amaryllids.

Amaryllis collectors who already have expensive virus-free collections should isolate new acquisitions for a period of at least one growing season to ascertain virus infection and to avoid contamination.

In addition to sterilization of implements and roguing, we would recommend application of insecticides (9) in field and greenhouse plantings. In the field, however, we would not expect that infection could be prevented because it would not be economically practical to apply insecticidal deposit. However, frequent applications would tend to keep down the aphid population. In a properly screened greenhouse we would recommend regular application of insecticide since aphid control in the greenhouse is feasible.

The following control measures are recommended:

In the greenhouse:

(1) Install screens (20-mesh or finer) on all vents and doors.

(2) Spray or fumigate (9) regularly to control greenhouse insects (especially aphids and thrips).

(3) Isolate valuable infected plants in fine-mesh cages in the greenhouse or isolate them outdoors.

(4) Remove all inexpensive plants showing virus-like symptoms.

(5) Keep amaryllids outdoors (whether they are symptomless or not) if they have been growing outdoors near vegetables or weeds rather than move any into a greenhouse containing symptomless amaryllids.

(6) Propagate from infected plants by seeds rather than cuttings if progeny will come true from seed.

(7) Isolate new acquisitions until the foliage can be examined for symptoms if a virus-free amaryllid collection has been established in a greenhouse.

(8) Plant resistant species or hybrids if these are available.

(9) Ramets of vegetatively propagated clones should be widely distributed to insure against possible loss by total infection of all stock (a recommendation by Dr. Traub to which the authors subscribe).

In the field or garden:

(1) Destroy all members of the Amaryllidaceae with virus-like symptoms if cost of plants is not a factor. Isolate from other symptomless amaryllids all infected plants that are too valuable to destroy.

(2) Keep weeds under control and destroy *any* cultivated or wild plants showing virus-like symptoms as a general phytosanitary practice.

(3) Apply insecticides to amaryllids as often as practical with a variety of insecticides (9) if insecticides are applied as a routine practice in the field or garden. These insecticide applications will tend to reduce insect populations but cannot be expected to eliminate virus-vectors.

(4) Grow resistant species or hybrids if available.

Cucumber mosaic virus is one of the most difficult viruses to control under field conditions since there are over 200 known hosts and 48 species of aphid vectors. Reservoir plants from which the aphids could transmit virus to amaryllids include weeds, ornamentals and vegetables.

DISCUSSION

We have established that cucumber mosaic virus can be isolated from *Amaryllis* and transmitted back to healthy *Amaryllis* by sap transfer and aphid transmission methods. We wish to emphasize that this identification refers to those amaryllid isolates which we can maintain in tobacco. (Sources 701, 703, 713, 714, 715, 719, 785, 802, 805, 810).

More than one virus may be associated with the *Amaryllis* mosaic disease. Evidence supporting this hypothesis is that we do have some source plants that yield virus which we can transmit only from amaryllids to *Amaryllis*, whereas we have other source plants from which we can isolate a virus that will infect tobacco as well as *Amaryllis;* yet, all source plants show typical *Amaryllis* mosaic symptoms. In addition, some isolates will incite concentric ring and line pattern symptoms as well as mosaic symptoms, whereas other isolates incite only mosaic symptoms. We are currently engaged in research to elucidate this problem.

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ACKNOWLEDGMENT

We wish to gratefully acknowledge the cooperation of Dr. P. R. Brierley, Crops Research Division, U. S. Department of Agriculture, Beltsville, and the technical assistance of R. L. Monroe, Crops Research Division, Glenn Dale, Maryland.

MOSAIC IN AMARYLLIS CALYPTRATA

W. QUINN BUCK, *Los Angeles State and County Arboretum, Arcadia, California*

The bulbs of *Amaryllis calyptrata* which were described in the 1962 Amaryllis Year Book, PLANT LIFE, Vol. 18, during the whole year of 1962 produced flower spikes at intervals. Some of the bulbs had as many as three and four spikes. The most important development in their history, however, has been the appearance of mosaic.

These fine species bulbs were benched alongside a large group of imported hybrid *Amaryllis*, all of which showed marked mosaic patterns in the foliage, but with no reduction in vigor of growth or quality of flowering. Along in the year the *Amaryllis calyptrata* plants nearest these imported hybrids began showing typical mosaic symptoms in the leaves, and after a few months their vigor was so markedly reduced (Fig. 29) that it seemed wiser to discard them, rather than risk infecting the remaining healthy stock. The root systems of some of the discarded bulbs appeared to be in fine shape, whereas part of the bulbs had few roots left.

Hereafter it will be necessary to keep a close watch on this species, as it would seem that mosaic, which apparently does not harm some hybrids, does damage *Amaryllis calyptrata* drastically.

Fig. 29. Upper, showing weakened bulbs of *Amaryllis calyptrata* due to Amaryllis mosaic on each side of a healthy, normal bulb.
Lower left, and right, showing Amaryllis mosaic patterns on the leaves of *Amaryllis calyptrata*. Photos by Jack V. McCaskill.

GROWING AMARYLLIS CLONE 'MRS. GARFIELD'

BURR CLOUETTE, *California*

Most amaryllisarians who have attempted to grow hybrid *Amaryllis* clone 'Mrs. Garfield' report that they have difficulty in getting it to grow properly. When I moved to San Diego, Calif., in Sept. 1961 from Salinas, Calif., I brought my one bulb of 'Mrs. Garfield' with me. This bulb was among those imported from India by Mr. Goedert, and had been grown at Salinas since Dec. 1960. The pot was placed in a sunny south window which was covered with a piece of plastic thus cutting down the light somewhat. It had only one leaf which soon withered and the bulb was leafless for some weeks, when new growth started. Soon there were three bright green white-banded leaves. Some mottling apparently due to mosaic was noted. Then two more leaves were formed, and an offset started to grow. The oldest leaf died, leaving three on one side, and one on the other.

While cleaning the window one day, the pot containing the plant was set in full sun. It was forgotten and it was left out for most of the day. The result was that the leaves of 'Mrs. Garfield' were badly burnt. Two of the leaves died, and one of the remaining leaves showed burning in the middle section. Soon a new leaf on the bulb and offset formed. Now on Sept. 15, 1962, the original bulb and offset each have three leaves. The important lesson from this experience is that 'Mrs. Garfield' needs some shading.

'Mrs. Garfield' seems to be nearly evergreen, and is leafless for only very brief periods of two to three weeks. Apparently the soil has to be kept moist most of the time, and when growth is active it should be given liberal waterings. I have found that growth is stimulated by frequent weak liquid fertilizing.

The bulb has increased in size and it is now over 1¾ inches in diameter, and one offset has been made. Although no flowers have been obtained as yet, the healthy plant which is increasing in size should possibly reward the care given it with flowers in the fall of 1963.

CONTROL OF AMARYLLIS RED LEAF SPOT

MRS. BERT WILLIAMS, *California*

I have had trouble with mildew and red spot of Amaryllis this season (1962). Experiments with the use of "Bactine"—used for athlete's foot- has given good results. A bulb imported from Holland was disfigured with red spot. Having nothing else on hand, I soaked it in "Bactine" and it is growing nicely now.

AMARYLLIS ROUND ROBIN NOTES, 1962

MRS. FRED FLICK, *Chairman*,
Amaryllis Round Robins, *Carthage, Indiana*

[The following notes were extracted from Round Robin letters by the Chairman of the Amaryllis Round Robins.—*Editor*]

Lydia Pahls, Miami, Fla.—I had my first look at the *Amaryllis evansiae*. It is lovely!—a small, pale yellow flower, with a nice shape. I left my *Amaryllis striata* with Mr. C., and he gave me some pollen from the *Amaryllis evansiae*. I had one other *A. striata* in bloom, and used the pollen on it. I have about fifteen seedlings of this cross.

Helen Elias, Conn.—The *Crinum* 'Cecil Houdyshel', which was planted out three years ago, came through the past winter (an extremely cold one) very well. There are now two offsets, and they sent up at least a dozen stems of lovely clear pink flowers, up to 36 inches tall, with at least two dozen flowers per stem. It was the conversation piece of our garden this year.

Opal Flick, Carthage, Indiana.—We have purchased twelve acres of land seventy miles from here. It is in a scenic hill section of Indiana. However, we have a four to five acre level area, with fertile, sandy loam. I set all my bulbs of the Amaryllidaceae there this past summer. These included *Amaryllis*, crinums; sprekelias; *Hymenocallis;* pancratiums; and *Zepheranthes*. The land had not been cropped for many years; and we had the weed growth disced in twice. Then I used some 12-12-12 fertilizer broadcast; with some bone meal worked into soil before the bulbs were set out. The growth made in this new soil was amazing; and several of the bulbs bloomed during the summer. On digging the bulbs in the fall, I found that the most of them had started to increase.

My extra special bulbs were planted out here at home. Len Woelfle's hybrid *Hymenocallis* 'Pax' was one of these. It was divided into two bulbs in the spring. Only the mother bulb bloomed. Both bulbs increased in size; and the mother bulb produced another bulb.

[**PLANT LIFE LIBRARY,** continued from page 68.]

THE COMPLETE GUIDE TO BULBS, by P. M. Synge. E. P. Dutton & Co., 300 Park Av. So., New York 10, N. Y. 1962. Pp. 320. Illus. In this guide (manual) to a selected number of plants with bulbous, cormous, tuberous or rhizomatous rootstocks, the author has condensed a vast amount of information. In an introduction the cultural practices in general are briefly summarized. This is followed by an alphabetical arrangement by genera under which the species and varieties are briefly described and cultural directions indicated. The guide is written from the standpoint of English climatic conditions and due allowances have to be made for the widely varying climates of the United States. It should be noted that in some instances outmoded names are applied to plants—*Hippeastrum* is used for *Amaryllis*, and *Amaryllis* is used for *Brunsvigia*. He includes the species of *Rhodophiala—advena* and *pratensis*—under *Hippeastrum*. He uses *H. rutilum* in place of *Amaryllis striata*, etc. There are 24 black and white, and 32 colored plates, some are not true to nature: for instance, *Sternbergia, Zephyranthes grandiflora, Narcissus serotinus* in plate 32.

PLANT LIFE

VOLUME 19

[Nos. 2-4, incl., Apr., Jul. & Oct.]

1963

General Edition

EDITED BY

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Harold N. Moldenke

THE AMERICAN PLANT LIFE SOCIETY

Box 150, La Jolla, California

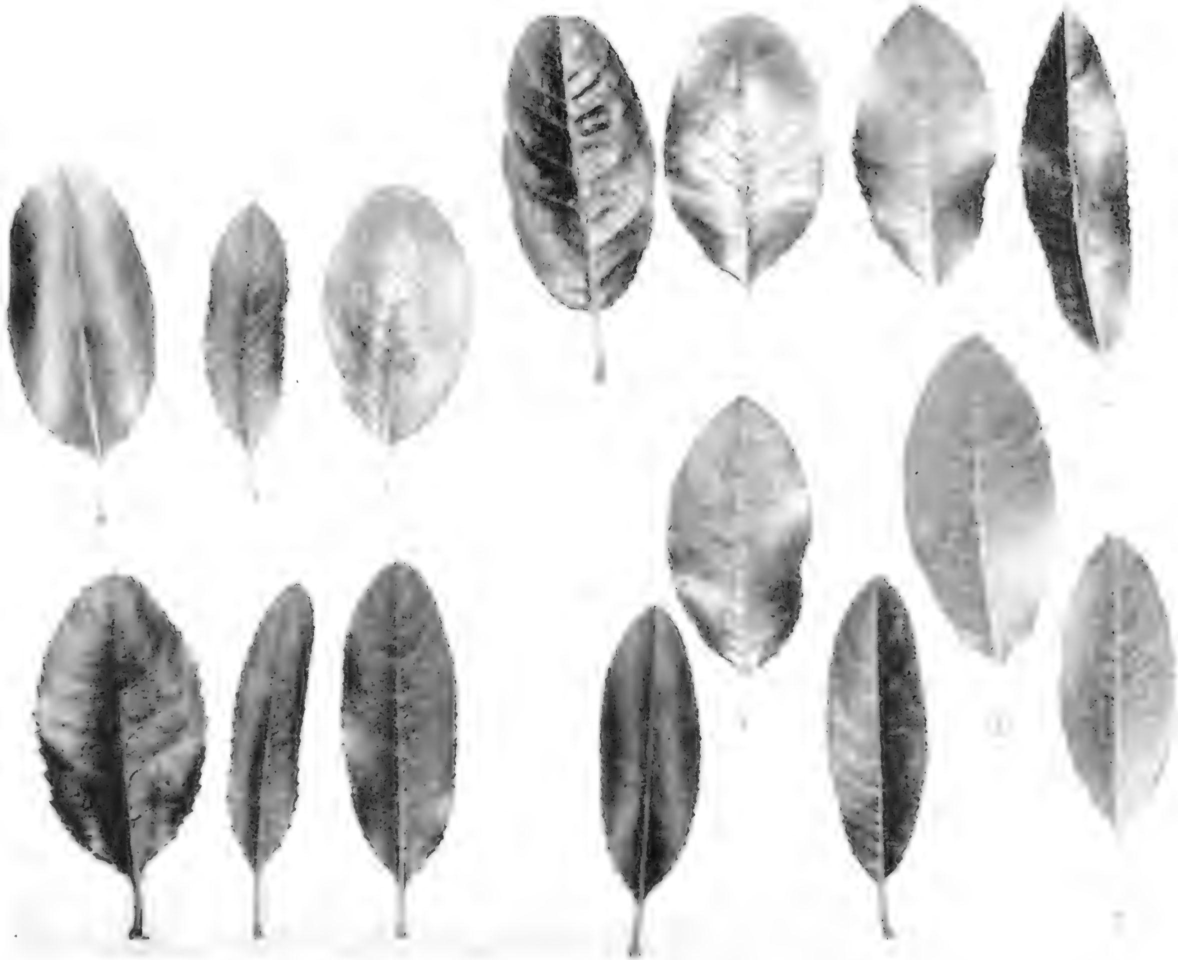

Fig. 30. Leaves of **Photinia arbutifolia** Lindl. Left, from seedlings of **macrocarpa** on quince root. Right,—top row, from three scattered plants growing in the Santa Clara Valley; middle row, from **macrocarpa** plants on quince root; bottom row, from individual multi-cotyledonous plants. NOTE—The two center leaves are from plants producing berries similar to those produced by the plants from which the leaves in the middle row were taken.

VARIATION IN PHOTINIA ARBUTIFOLIA

W. M. James, *California*

Photinia arbutifolia, Lindl. (*Heteromeles arbutifolia* Roem. *H. saliscifolia* Abrams., *Crataegus arbutifolia* Ait. not Lam.) is an attractive, well-known evergreen shrub found only in California and Lower California. It grows below 4000 feet in the Coastal ranges from Humboldt County through Southern California into Mexico and in the Sierra Nevadas from Shasta to Tulare Counties. *P. arbutifolia* var. *macrocarpa* Munz grows only on Santa Catalina and San Clemente Islands off the Southern California Coast. A yellow-berried form, *P. arbutifolia* var. *cerina Jeps.*, is found in San Luis Obispo County. The type was first discovered or noted by Menzies in 1792 near the present site of San Francisco. He considered it a *Crataegus* and introduced it to cultivation in England, where it has been grown sparingly ever since under the name of California Maybush, "May" being an English synonym for the Hawthorn.

Extensive casual observation made by the writer for several years indicated a rather uniform shape and serrulation of the leaves on the plants growing on the mainland. Size of leaf can be influenced by varying light and soil conditions. He has never seen the varieties *macrocarpa* and *cerina* growing in their natural habitats. Seeds of *macrocarpa* were received annually from Catalina Island for several years. Leaves accompanying these fruits were always a little shorter, more rounded on the ends, the serrulations not quite so deep, and in general appeared to be about as uniform as those found on the type. The berries on the *macrocarpa* plants are about twice the size of those from the plants on the mainland.

Photinia arbutifolia is often difficult to grow in gardens because there is generally more water applied than it requires. Scions from two plants from the San Jose area were grafted on quince root, hoping to get plants that would do better under general garden conditions. These grafts made a good union and several plants sent out for trial have done well, although the quince root has a dwarfing effect. Twigs received with the fruits of *macrocarpa* from Santa Catalina Island also made a good union on the quince root and are growing and fruiting satisfactorily. As the bushes are not very large, this form also probably shows some dwarfing effect from the new root.

In transplanting seedlings of both the island and mainland forms, fifteen to twenty multi-cotyledonous plants per thousand were noted. Most of these had four, a few had three or five, cotyledons. Some of these were isolated to grow on for observation.

Two of these selected plants have produced fruits that outwardly appear to be the same as those from *macrocarpa* and the leaves are also similar. Another plant is very different. In one season it grew three times the height of the two just mentioned. The limbs are very stiff and straight. The leaves are longer, narrower and more sharply serru-

lated than any the writer has seen. The berries are the same as those of the type, but the cluster is larger and somewhat stiff and open. Seedlings grown from seed produced by the *macrocarpa* form on quince root show some variation in the leaves. The difference shows clearly in Fig. 30.

Cuttings from all forms are being grown and it is hoped to have plants of the entire group on their own roots growing side by side under the same conditions. If the present difference in foliage and berries is still apparent, then an examination for polyploidy might be interesting.

EASY METHOD FOR ROOTING CUTTINGS

BURR CLOUETTE, *California*

With a little variation, the following method of rooting cuttings may be applied to various types of plant material. The basic materials are some sort of container—pots, or even milk cartons cut in half with drainage holes at the corners; vermiculite; rooting hormone such as "rootone"; complete soluble or liquid fertilizer, and a little patience.

If half milk cartons are used, these are washed clean, and small triangular holes are made at the corners. They are filled with vermiculite, either grade although the coarser is better, especially for cuttings taking a long time to root. The coarser grade does not pack and become soggy as the finer does in time. Before cuttings are planted, water is applied so that it runs out of the drainage holes freely. It is a good plan to place some gravel in the bottoms of the containers used which prevents the vermiculite from washing out.

The cutting material should be fresh, and the cut is made at the node. The lower leaves are trimmed off, and the lower half inch of the base of the cutting is dipped in rooting powder. With tender subjects, it is worth while to rub the powder on leaf scars also. This will control rotting below the soil line. A hole is made in the vermiculite and the cutting is inserted to about 1/4 of its length. The vermiculite is firmed around the cutting. Water is applied lightly by sprinkling so that foliage is wet. The cuttings are set in the shade, and are watered slightly daily by sprinkling to wet the foliage. Material that will take the sun is moved gradually to the proper sun exposure.

Cuttings from such subjects as geraniums and cacti, are set in the shade for a time before planting—geranium cuttings for a day or two, and cacti for as long as two weeks. For most cuttings, it is better to plant at once. For very tender cuttings, and tip or leaf cuttings, a plastic bag is placed over the container. After the cutting stops wilting, holes are cut in the bag for ventilation, and then it is later finally removed.

The advantage of using half milk cartons as containers is the ease of transplanting. The carton is cut open and the rooted cutting is removed for planting.

After the first week, the cuttings should be watered weekly with any soluble or liquid complete houseplant fertilizer, using reduced strength

at first. Many cuttings are ready for transplanting in three or four weeks.

PLANT SCIENCE FOR THE LAYMAN

Nathan William Easterly,
Bowling Green, State University, Bowling Green, Ohio

A college freshman would define botany as the study of plants. The more daring ones might amend the definition to read "pickled plants", or the study of lifeless colored slides, or even the study of dry hay. The implications here are exaggerated but by how much? More mature students in their junior and senior years realize that botany encompasses all studies of plant life whether it pertains to the pure science or to the applied sciences of medicine, agriculture, forestry and horticulture. Much could be discussed concerning the interrelationships or the lack of interrelationships of these sciences. However, I would like to focus attention on those who should benefit from the study of botany rather than on the subject matter of botany.

There are at least five groups who may take courses in college botany: (1) graduate students and undergraduate majors in biology or botany, (2) undergraduates who take botany as an elective, (3) undergraduates who take botany as a science requirement, (4) returning secondary school teachers who renew their certificates, and (5) interested lay people.

There is no question in my mind concerning the education of the first group. These people are being trained for research activities or a combination of teaching and research. They have very definite goals outlined for themselves and they go where adequate facilities and research opportunities exist. But we still have the remaining four groups left. What do we do for them? Should they be trained along the same lines as the first group? Should not more attention be focused on the avocational possibilities of botany as well as the vocational aspects?

The major word that was left out in the definition of botany by the freshman was *life*. Botany is a living science. If I can show the freshman that living plants make up the farmer's agricultural crops and the relationship of biological phenomena to these crops, I have advanced a long way in making botany a meaningful science course to this student. Going a bit further, if I can show him how living plants can broaden his interests in our day to day living, I have made a contribution in his behalf. This approach should strengthen the objectives of groups (2) and (3).

The secondary school teachers should be given up-to-date scientific information. Since they are working with a younger generation, these teachers also need to know the practical applications or even the aesthetic qualities of botany. To give them the impression that botany is a pure science devoted only to scholarly research activity is deadly.

The last group of people represent somewhat of an anomaly according to some of the scientific personnel. They are much interested in

living plants. Yet, they are led to believe that botany and horticulture do not mix. One of the most significant contributions botanical educators could make would be to correct this false notion. Many botanists bristle at the term "popular botany". The science of botany ceases to be a science. This need not be the case if the instructors have been thoroughly trained in plant science.

The study of herbarium specimens, of prepared slides and even adequately preserved specimens is essential but often the love of living plant life and how plants live among their cohorts is overlooked in basic botany courses. The above remarks should not be construed to be derogatory. The need for more research is evident. The need for more educational activity on all levels should be just as evident. Even in the first group of people, i.e. the trained scientist, the broadest training in botany is needed to give them an understanding of their student's needs. For the remaining four groups of people, the study of botany, or plant science, as an avocation should broaden and enrich their existence.

PLANT LIFE LIBRARY

SEED PRESERVATION AND LONGEVITY by Lela V. Barton, John Wiley & Sons, Interscience Division, 440 Park Av., South, New York 16, N. Y. 1962. pp. 216. $9.50. Illus. Individuals curious about the facts concerning the perennially recurring story of Egyptian mummy wheat, or the reported extreme longevity of lotus seeds can find authoritative answers to their questions in SEED PRESERVATION AND LONGEVITY. Dr. Lela V. Barton of the Boyce Thompson Institute for Plant Research has brought together an enormous quantity of documented information about seeds in this book. She is probably one of the best qualified persons in the country, if not in the world, to author a book on seeds. The Bibliography indicates that Dr. Barton published a paper on seeds as long ago as 1930, and a continuous flow of published material about seeds has issued from her experimental work since that time.

The book has evidently been designed as a reference and text, particularly for seed technologists, seedsmen, and others connected with the seed industry. The subject matter is so important, however, that the book should be attractive to agronomists, horticulturists, foresters, and those who work in other applied fields of botanical science.

Besides chapters on "Records of old seeds", "Life-span of seeds buried in the soil", "Moisture effects", and "Other factors affecting longevity", there are separate chapters on the longevity of the economically important classes of seeds such as vegetable, flower, field, tree, etc. Two interesting and significant chapters on "Methods of testing for viability" are followed by chapters with the titles "Plants from old seeds" and "Causes of deterioration". There is a final chapter on "Practical considerations".

A glossary of just over 130 terms will be useful to those unacquainted with the technical jargon of seed technology. Accurate indexes, both subject and author, add to the book's reference value. Slightly more than 31 pages are devoted to a Bibliography of about 850 citations. In spite of its length there are some surprising omissions in the Bibliography; for example, the valuable reference work, VEGETABLE AND FLOWER SEED PRODUCTION by Hawthorne and Pollard is not cited. There are 22 tables, 13 plates, and 13 text figures. The plates are well reproduced, but the legends for some plates seem a little cumbersome.

The reviewer has noted a few typographical errors, but these are almost inevitable in the production of any book. The writing tends to be pedestrian, but this is to be expected, since present knowledge about seeds is not easily phrased in sprightly language. SEED PRESERVATION AND LONGEVITY should be

required reading for anyone even remotely connected with the seed industry. Furthermore, those biologists who are occasionally troubled with problems relating to seeds, could well afford to have this book on their reference shelf.—*Thomas W. Whitaker.*

PLANT TAXONOMY: METHODS AND PRINCIPLES, by Lyman Benson. Ronald Press, 15 E. 26th St., New York 10, N. Y. 1962. Pp. 494. Illus. $11.50. Dr. Benson is to be commended for his evolutionary approach to the subject of taxonomy which is in harmony with the best work in this field now being carried on. In addition he does not neglect nomenclature, and the presentation of the data obtained. The book is in five parts: (1) exploration for data, including data from various fields; (2) classification—principles, and the higher categories; (3) choice of names; (4) description and documentation, and (5) treatises and monographs. This stimulating text is highly recommended.—*H. P. Traub.*

PLANT LIFE IN PALESTINE: ISRAEL AND JORDAN, by M. Zohary. Ronald Press, 15 E. 26th St., New York 10, N. Y. 1962. Pp. 262. Illus. $8.00. This book by *the* authority on the subject is a welcome addition to the other important texts which he has produced in the past. After considering the topography, soil, climate and plant life of the region, he discusses the structure and development of the vegetation classes, and the biogeographical areas, and the continuing influence by man on the structure of the vegetation. This outstanding book is highly recommended.

REGENERATION, edited by D. Rudnick. Ronald Press, 15 E. 26th St., New York 10, N. Y. 1962. Pp. 272. Illus. $9.00. The discussions in this symposium by eight authorities deal with new and special aspects of the subject: (chapters 1—3) regeneration in invertebrates—sponges, hydra and flatworms; (chapters 4—5) regeneration in plants stimulated by tumor producing agents, and by excision and culture of parts; (chapters 6—8) application of new methods to the study of the amphibian eye. This stimulating book is highly recommended.

THE FLOWER ARRANGEMENT CALENDAR, 1963, by Helen Van Pelt Wilson. M. Burrows & Co., 425 Park Av. So., New York 16, N. Y. 1962. Illus. The publishers sponsor an annual flower arrangement calendar contest. In this little book some of the outstanding photographs of floral arrangements accepted by the publishers are reproduced in calendar form for 1963. The Calendar will be useful to those interested in flower arranging.

A BOOK ABOUT SOILS FOR THE HOME GARDENER, by H. S. Ortloff and H. B. Raymore. M. Barrows & Co., 425 Park Av. So., New York 16, N. Y. 1962. Pp. 189. $3.95. This popular treatise is in two parts: (1) the nature of soils—how formed, physical properties, composition, habitability, chemical fitness, fertilizers, acidity, soil organisms, and how plants grow; (2) soil management—appraisal and evaluation, supplying water, excess water, tillage and cultivation, tools, soil distribution by geographical regions.

BIOLOGY: ITS PRINCIPLES AND IMPLICATIONS, by Garrett Hardin. W. H. Freeman & Co., 660 Market St., San Francisco 4, Calif. 1961. Pp. 682. Illus. in two colors. $8.00. This attractive text by an outstanding authority will be welcomed by the student. The book is in four parts: (1) introductory principles—the ways of science, cells and cell division, the molecular world of cells, chemical basis of life: cybernetic equilibria, mechanisms of evolution and mutations; (2) our plant dependent world—autotrophs and heterotrophs; (3) animals, including man; and (4) heredity and nature and origin of life. This is a stimulating book such as only Dr. Hardin can produce. It is highly recommended.

BOTANICAL HISTOCHEMISTRY: PRINCIPLES AND PRACTICE, by W. A. Jensen. W. H. Freeman & Co., 660 Market St., San Francisco 4, Calif. 1962. Pp. 408. Illus. $10.00. The purpose of this important book is to present about 200 histochemical procedures, and to give examples for their use in the investigation of botanical problems. The text is in four parts: (1) general considerations—quantitative and microscopic histochemistry; (2) preparation of the tissue; (3) tissue and cell analysis; and (4) histochemical techniques. This excellent new text fills a definite need, and is highly recommended.

LIFE BEYOND OUR PLANET, by D. Q. Posin. McGraw-Hill Book Co., 330 West 42nd St., New York 36, N. Y. 1962. Pp. 128. Illus. $3.25. The author believes that intelligent beings have evolved not only on earth but also on other planets, and he offers what he considers as compelling arguments in support of his viewpoint. This fascinating book stimulates the imagination and will appeal to all —teenagers and adults.

LIFE: ITS NATURE, ORIGIN AND DEVELOPMENT, by A. I. Oparin (trans. by Ann Synge). Academic Press, 111 Fifth Av., New York 3, N. Y. 1962. Pp. 207. Illus. $4.50. An outstanding authority in this field points out that the problem of the origin of life, formerly considered on the metaphysical basis, and the problem of the essential nature of life, are really one. This book is an attempt to consider the subject from this unitary approach: (1) the nature of life; (2) the origin of life; (3) the earliest period of the development of life; (4) the further evaluation of life, and (5) conclusions. This book will be read by all who are interested in the nature and origin of life.

ADVANCES IN AGRONOMY, Vol. 14, edited by A. G. Norman et al. Academic Press, 111 Fifth Av., New York 3, N. Y. 1962. Pp. 432. Illus. $13.00. Nineteen authorities have contributed papers to this volume devoted to reviews and research progress in soil and crop science and developments in agronomic practice. This rich harvest is arranged under eight chapters: (1) laterite; (2) rice improvement and culture in the U. S.; (3) rainfall erosion; (4) soybean genetics and breeding; (5) fertilizers and the efficient use of water; (6) evaluation of fertilizers by biological methods; (7) isotopes methods and uses in soil physics research; and (8) management of soybeans. Highly recommended

A SYNTHESIS OF EVOLUTIONARY THEORY, by H. H. Ross. Prentice-Hall, Englewood Cliffs, N. J. 1962. Pp. 387. Illus. $10.00. This outstanding new book by an eminent authority was written, for those having a background in the natural sciences, to integrate knowledge from various fields into a unified theory of evolution, "from cosmic dust to biomes." The sections of the book are concerned with the expansion of evolutionary concepts, the evolution of the universe, origin and nature of life, sources of variability, natural selection, species and species change, increase in number of species, evolution of communities, origin of biome and succession, comparative evolution of biomes, the geotectonic factor, the organization of matter and life. This stimulating book is highly recommended.

NON-PROFIT CORPORATIONS AND ASSOCIATIONS, by H. L. Oleck. Prentice-Hall, Englewood Cliffs, N. J. 1956. Pp. 460. $12.50. With the increase of non-profit organizations in the United States, there has arisen a need for this excellent book which explains how they are organized, how they are managed, and how they are dissolved. The treatise provides lawyers and laymen alike with an exposition of the American system of procedures, rights, and liabilities of such organizations. This comprehensive book fills a long felt need and will be welcomed by all who are involved in the management of non-profit organizations. Highly recommended.

FOSSILS: AN INTRODUCTION TO PREHISTORIC LIFE, by W. H. Matthews III. Barnes & Noble, 105 Fifth Av., New York 3, N. Y. 1962. Pp. 337. Illus. Paperback. $5.75. This introductory book is designed primarily as an amateur collector's handbook. However, it should prove helpful to students of paleontology and historical geology. It provides a general background in earth history, and a survey of the types of plants and animals that inhabited the earth in prehistoric times. Dr. Matthews is to be congratulated on his attractive book which is highly recommended.

PREHISTORIC LIFE ON EARTH, by Kai Petersen et al. E. P. Dutton & Co., 300 Park Av. So., New York 10, N. Y. 1961. Pp. 163. Illus. $4.95. This is an adapted and supplemented version of Petersen's brief summary of evolution of life on earth with emphasis mostly on animal life. The evolutionary processes are illustrated by means of descriptions of actual reconstructions of the types of creatures and environments that have succeeded one another through the millions of years of earth's prehistory. The text illustrations are outstanding. This charming book is recommended to all readers, and is a bargain at the price indicated.

[**PLANT LIFE LIBRARY**, continued on page 26.]

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

I. THE AMERICAN AMARYLLIS SOCIETY

[Affiliated with the American Plant Life Society]

[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

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Mr. Edward F. Authement, Asst. Registrar, 2214 Gallier St., New Orleans 17, La.

Mrs. Emma D. Menninger, Asst. Registrar, 700 North Old Ranch Road, Arcadia, Calif.

Correspondence about the registration of plant names should be sent directly to Mr. Morton, and a self-addressed, stamped envelope should be enclosed if a reply is expected.

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1. **AMARYLLIDACEAE: TRIBE AMARYLLEAE**, by Traub & Moldenke (including the genera Amaryllis, Lycoris, Worsleya, Lepidopharynx, Placea, Griffinia, and Ungernia; Manila covers; 194 pages, incl. 18 illustrations. $5.00 postpaid.
This is required reading for every amaryllid enthusiast.

2. DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893—1948, by Norton, Stuntz, and Ballard. A total of 2695 Hemerocallis clones are included and also an interesting foreword, and explanatory section about naming daylilies. Manila covers; 100 pages (1—X; 1—90), includes a portrait of George Yeld. $2.50 postpaid.

3. THE GENERA OF AMARYLLIDACEAE, by Hamilton P. Traub. Includes a general introduction, a key to the subfamilies, infrafamilies, tribes, subtribes and genera of the Amaryllidaceae, and brief descriptions of all the genera. Manila covers; publ. 1963; 85 pages. $5.00 postpaid.

PERIODICALS

(A) **HERBERTIA** [**First series,** 1934 to 1948, incl.], devoted exclusively to the amaryllids (Amaryllidaceae), and the workers concerned in their advancement. A complete set of these volumes is indispensable to all who are interested in the amaryllids. Libraries should note that this may be the last opportunity for complete sets.

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[CLOUETTE—AMARYLLIS RECORDS, continued from page 132.]

hybrid *Amaryllis*. Five seeds of *Amaryllis blumenavia* from Dr. Traub planted over a month ago shows only one has sprouted up to the present, but others may sprout later. Four seeds of *Crinum gouwsii* from Dr. Traub have all sent out roots, and apparently will send up sprouts later. Many other amaryllid seeds from Dr. Traub have sprouted. Seeds from my own *Amaryllis* crosses have been planted and germination has been good in some cases and less so in others. All of these hybrids are making good growth.

[CORRIGENDA, continued from page vi]

REVISION OF "THE PHYLA OF ORGANISMS"

HAMILTON P. TRAUB

The summary entitled, "The Phyla of Organisms" (Traub, 1962) was prepared in 1961 and published in 1962. In the same year, Stanier and van Niel (1962) published a valuable contribution synthesizing the knowledge about the blue-green algae and the bacteria. The outstanding new concept advanced is that the blue-green algae and the bacteria have a similar cellular structure, the *procaryotic*, as contrasted with the *eucaryotic* cellular structure of the rest of the cellular organisms (plants, heteroplants (fungi) and animals). On the basis of this contribution, the phyla are slightly rearranged with appropriate group name changes as shown in Table 1.

TABLE 1.

- Kingdom 1. PROCARYOTAE
  - Subkingdom 1. AUTOPROCARYOTAE
    - Superphylum 1. AUTOCHEMOBACIAE
      - PHYLUM 1. **AUTONITROBACAE**
      - PHYLUM 2. **AUTOHALOBACAE**
      - PHYLUM 3. **HYDROGENOBACAE**
      - PHYLUM 4. **CARBOXYBACAE**
    - Superphylum 2. AUTOPHOTOBACIAE
      - PHYLUM 5. **CHROMATOBACAE**
      - PHYLUM 6. **CHLOROBACAE**
      - PHYLUM 7. **CYANOBACAE** (ex blue-green algae)
  - Subkingdom 2. HETEROPROCARYOTAE
    - PHYLUM 8. **HETEROBACAE** (heterotrophic bacteria)
- Kingdom 2. EUCARYOTAE
  - Subkingdom 1. AUTEUCARYOTAE (autophototrophic plants)
    - Superphylum 1. ANEMBRYOPHYTIAE
      - PHYLUM 9. **RHODOPHYTA**
      - PHYLUM 10. **PYRROPHYTA**
      - PHYLUM 11. **CHRYSOPHYTA**
      - PHYLUM 12. **PHAEOPHYTA**
      - PHYLUM 13. **EUGLENOPHYTA**
      - PHYLUM 14. **CHLOROPHYTA**
    - Superphylum 2. EMBRYOPHYTIAE
      - PHYLUM 15. **BRYOPHYTA**
      - PHYLUM 16. **TRACHEOPHYTA**
  - Subkingdom 2. HETEROPLANTAE
    - PHYLUM 17. **RETICULOMYCOTA** **(Labyrinthula)**
    - PHYLUM 18. **MYXOMYCOTA**
    - PHYLUM 19. **EUMYCOTA**
  - Subkingdom 3. ANIMALIA
    - (Phyla nos. 20 through 43, incl., remain the same as in Traub, 1962)

"The Phyla of Organisms" (1962) will be revised in Traub,—"Lineagics", to be published in 1964.

LITERATURE CITED

Stanier, R. Y., and C. B. van Niel. The concept of a bacterium. Arkiv. Microbiol. *42*: 17—35. 1962.

Traub, Hamilton P. The phyla of organisms. Publ. as a suppl. to Plant Life. vol. 18. 1962.

PLANT LIFE

1964

AMARYLLIS YEAR BOOK

Amaryllis calyptrata

THE AMERICAN PLANT LIFE SOCIETY

THE AMERICAN PLANT LIFE SOCIETY is organized for the "increase and diffusion of knowledge concerning plant life," and to carry out its objectives the main emphasis is placed on the publication of PLANT LIFE, the periodical devoted to plant life, incl., HERBERTIA, the yearbook devoted exclusively to the amaryllids, sponsored by the affiliated AMERICAN AMARYLLIS SOCIETY. The publications are international in scope. All paid up members are privileged to receive the current issues of PLANT LIFE, incl., HERBERTIA.

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PLANT LIFE

VOLUME 20

[Nos. 1-4, Jan., Apr., Jul. & Oct.]

1964

EDITED BY

Hamilton P. Traub

Harold N. Moldenke

THE AMERICAN PLANT LIFE SOCIETY

Box 150, La Jolla, California

Printed in the United States of America

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TABLE OF CONTENTS

The cover design by Penrith B. Goff is based on *Amaryllis calyptrata* as grown by W. Quinn Buck, at the Los Angeles Arboretum, Arcadia, Calif.

PLANT LIFE, VOLUME 20, NO. 1. 1964—AMARYLLIS YEAR BOOK GENERAL AMARYLLID EDITION

PLANT LIFE, VOLUME 20, NOS. 2—4, INCL, 1964
GENERAL EDITION

1964 SUPPLEMENT

ILLUSTRATIONS

CORRIGENDA

PLANT LIFE, VOL. 19. 1963

Page 17, under "LITERATURE CITED", 2nd line from bottom, for "Vol. 18. 1963" read "Vol. 18. 1962".

Page 55, under "Tribus Traubieae, etc.", 1st line, delete "genus Brunsvigia Heist."

THE GENERA OF AMARYLLIDACEAE, BY HAMILTON P. TRAUB; PUBL. 1963

Page 17, under "44. HABRANTHUS", "H. brachyandrus", change "48" to "24".

Page 36, under "10. TRISTAGMA", "Syn.—", delete reference to "Gardinia Bert.", which is a *nomen nudum* (see Plant Life, Vol. 20. 1964).

Page 54, 15th line from bottom, "for "Buty" read "Bury".

(CONTINUED from page 130.)

EXPLORING THE UNIVERSE, edited by Louise B. Young. McGraw-Hill, 330 W. 42nd St., New York 36, N. Y. 1963. Pp. 457. Illus. $6.95. This stimulating book is based on contributions of fifty-three outstanding ancient and modern scientists. The subject matter included is calculated to up-date the adult members of society on the rapid progress in science in recent times. The selections are arranged under convenient headings—what is the nature of science?; is there a scientific method?; is there an order in nature?; is truth scientific?; what is a scientific fact?; is there a limit to man's understanding of nature?; are theories true?; how was the universe created?; is there other life in the universe?; why explore space?; and what are the values and limitations of science? This thought-provoking book is highly recommended to all adults who wish to keep up with recent progress in science.

THE NEW YORK TIMES GARDEN BOOK, edited by Joan Lee Faust. Alfred A. Knopf, 501 Madison Av., New York 22, N. Y. 1962. Pp. 368 + i—xi. Illus. $6.95. Outstanding authorities contribute articles on various phases of gardening to the Sunday edition of the New York Times. The garden editor has selected more than 100 of these for inclusion in this attractive book. The subject matter covers a wide range. Part I is devoted to landscaping; Part 2, to trees and shrubs; Part 3, to garden flowers; Part 4, to lawns; Part 5, to places to garden; Part 6, fruits and vegetables; Part 7, to propagation; Part 8, to house plants, and Part 9, to the four seasons in the garden.

PLANT PATENTS; WITH COMMON NAMES, 1 THROUGH 2207, 1931-1962. Published by the Amer. Assoc. of Nurserymen, 835 Southern Bldg., Washington 5, D. C. 1963. Pp. 74. $2.00. This is a revised edition of "Plant Patents; Common Introductory Names" which has been reviewed in previous issues of Plant Life. The new directory, page size 8½ x 11", contains all of the information of the previous directory and the five annual supplements, and the information on the plant patents granted to the end of 1962. The new directory, as the old, provides separate numerical and alphabetical listings. The numerical listings show besides the plant patent number, the date of issue, the kind of patent, the common name assigned the plant, the name of the originator, and the name of the person or company to whom the patent has been assigned, providing the patent had been assigned prior to issuance of the patent. The common names are alphabetized by species. The combined list of originators and persons to whom the patents have been assigned, is also arranged alphabetically with mailing addresses.

AN ANNOTATED CHECKLIST OF CULTIVATED PALMS, by H. E. Moore. The American Palm Society, 7229 S. W. 54th Av., Miami, Fla. 33143. Pp. 65. $2.00, including postage. This 65 page publication is the culmination of several years' work by Dr. Moore. It represents an up-to-date compilation of the correct botanical names of the palms now known in cultivation, also names frequently used in the trade, country of origin, authorities, and references in botanical literature. It will become an essential part of the library of anyone who is interested in the correct identification of palms.—*David Barry, Jr.*

THE DEVELOPMENTAL ANATOMY OF ISOETS, by D. J. Paolillo, Jr. Univ. of Illinois Press, Urbana, Ill. 1963. Pp. 130. Illus. Paperbound. $2.50; clothbound, $3.50. This is another volume in the important series of Illinois Biological Monographs. In this research project, the developmental anatomy of the *Isoetes* was established on the basis of comparisons in the structure from the sporling to the adult stages. This includes observations on growth of the shoot tip, lateral meristems and root-producing meristems, and on procambial differentiation, root initiation, and the growth of the apical meristem of the root. The 19 plates at the end of the book are excellent. This outstanding book is highly recommended to the plant scientist.

(CONTINUED on page 5.)

PLANT LIFE, VOL. 20, NO. 1, January, 1964

AMARYLLIS YEAR BOOK 1964

Year Book of
The American Amaryllis Society
31st issue

GENERAL AMARYLLID EDITION

EDITED BY
HAMILTON P. TRAUB
HAROLD N. MOLDENKE

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

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[THE AMERICAN AMARYLLIS SOCIETY—continued on page 131.]

PREFACE

The outstanding cover design featuring *Amaryllis calyptrata* is the work of the Artist to the Society, Prof. Penrith B. Goff of the University of Chicago. Again, he is to be congratulated on an excellent job.

It is fitting that the 1964 issue of THE AMARYLLIS YEAR BOOK is dedicated to Mr. Samuel Y. Caldwell, who is known to his many friends as Sam Caldwell, for his outstanding contributions toward the advancement of various amaryllids, particularly *Lycoris* species and hybrids. Your editor had been interested for a long time in the genus *Lycoris* and it had been difficult to make progress toward interesting the general gardening public in this utterly beautiful subject until Mr. Caldwell took up the cause. He made a collection of as many species as he could obtain and flowered them at his home in Tennessee which is an ideal location for many of the species, excepting the very tender subtropical ones. He furnished herbarium specimens to the writer so that they could be worked into the *Lycoris* identification project. During the past two decades most of the species have been identified. Only a few still have to be traced down. Mr. Caldwell's contribution toward determining the garden value of *Lycoris* in the United States is outstanding. He not only assisted in the identification of species, but he also began the breeding of Hybrid *Lycoris* is earnest and the outstanding results he has obtained are reported in a paper in the present issue. For his eminent service toward the advancement of *Lycoris*, and other amaryllids, the 1964 WILLIAM HERBERT MEDAL has been awarded to him. The best wishes and congratulations of the entire membership go with this award. Mr. Caldwell contributes a charming autobiography to this issue.

Mr. Percy-Lancaster again favors the members with his charming reports on his trip from India to Rhodesia and return, and on his holiday in Southern Rhodesia. Mrs. Clint reports on an interesting trip to the Mexican West coast.

The articles on *Amaryllis* in the present issue include a report on the flowering of *Amaryllis calyptrata* by Mr. Buck, and on the growing of this species by Mr. Clouette. Mr. Crochet and Mrs. Barry write on *Amaryllis* breeding, and on the growing of these plants in pots. Mr. Buck reports on the outstanding Angell Amaryllis hybrids; Mr. Morris presents an article on species *Amaryllis* as grown in Australia; Mr. Clouette, Mr. Beckwith Smith and Mrs. Pickard, write about *Amaryllis* culture. Mrs. Herold indicates the landscape value of Amaryllis; Mr. Perrin reports on overwintering *Amaryllis*, and Mrs. Tebben writes about the effects of the freeze in Florida on *Amaryllis*. Mr. Sudd writes on the culture of *Amaryllis* under artificial light. Mr. Goedert again favors the members with an excellent review of the *Amaryllis* season just past. The Supplement to the present volume consists of the "Catalog of Hybrid Amaryllis Clones."

The other amaryllids are not neglected. In addition to the fine *Lycoris* report by Mr. Caldwell, there are articles by Mr. Hunt on a new pink *Lycoris* and the creamy white species; and on hybrid *Lycoris* by Dr. Takemura. Mr. Higginson and Mr. Hannibal, and Mr. Hannibal

write about Crinums. Mrs. Shirley again contributes a fine article on American Crinums. Mr. Korsakoff writes about the preparation of herbarium specimens, and about his interest in the Zephyrantheae. Dr. Flory reports on chromosomes in *Hemerocallis*. Mrs. Clint writes about a fine hybrid involving *Zephyranthes bifolia*. Mr. Decker reports on growing amaryllids on tap water; and Mr. Hunt on winter hardiness in amaryllids.

There are other articles, including also reports on the *Amaryllis* exhibitions in 1963; a report on the honors received by Mrs. Pickard, and other contributions.

Contributors to the 1965 issue of THE AMARYLLIS YEAR BOOK are requested to send in their articles by August 1, 1964, in order to insure earlier publication of this edition. Unless articles are received on time, publication will again be delayed to June or July or even later as with some issues in the past. Your cooperation toward earlier publication will be greatly appreciated.

December 15, 1962,
5804 Camino de la Costa,
La Jolla, California 92-037

Hamilton P. Traub
Harold N. Moldenke

TRAUB'S "AMARYLLIS MANUAL", SECOND PRINTING

Word has been received from MacMillan Co., 60 5th Av., New York, N. Y. 10011, that the second printing of this work will be ready on July 14, 1964.

TRADE CATALOG RECEIVED

Bloem Erf Nurseries, P. O. Box 210, Stellenbosch, South Africa. "Catalogue of South African Native Bulbs, Seeds and Plants" 36th Edition. Jan. 1964—1965. Mrs. L. Richfield, proprietor. Among amaryllids, the following genera are represented—*Brunsvigia rosea* (syn.- "Amaryllis belladonna Herb. 1821, non L. 1753"), *Boophone, Clivia, Crinum, Haemanthus, Nerine, Tulbaghia.* Although there is blank space, it is stated that *Cyrtanthus* are not listed because "It is simply not possible to describe these year after year, when so many other items are offered." Thus the enthusiast interestd in South African amaryllids misses *Cyrtanthus* (including *Vallota*), *Agapanthus, Ammocharis, Cybistetes,* other *Brunsvigia* species, *Anoiganthus, Cryptostephanus, Gethyllis, Apodolirion, Hessea, Carpolyza, Strumaria* and *Pancratium trianthum.* It is hoped that these deficiencies may be made good in a future catalog.

JACK'S NURSERIES, Jack & Jean Bester, P/bag, Meyerton, Transvaal (J. J.), South Africa. This price list is concerned with various plant species, but seeds of the large-flowering **Amaryllis** hybrids represent the only amaryllids offered. The Besters report on collection trips, and possibly they will list other amaryllids in later price lists.

THIS EDITION

DEDICATED TO

SAMUEL YONGUE CALDWELL

(CONTINUED from page vi.)

PRINCIPLES OF NUMERICAL TAXONOMY, by R. R. Sokal and P. H. A. Sneath, W. H. Freeman & Co., 660 Market St., San Francisco 4, Calif. 1963. Pp. 359. Illus. $8.50. There has been a need for a text on the application of mathematical procedures to the grouping of organisms into lineages, and the authors are to be congratulated for producing the first book on the subject. The necessary formulas are given along with the text discussions, and in the appendix, brief illustrative examples are presented for the assistance of those who have not been exposed to mathematical compution by means of electronic computers. The authors are apparently under the impression that they must demolish the customary Neo-Adansonian procedures that are presently used by the great majority of lineagicists which have served well. These consist in (a) making groupings on the basis of overall similarities with or without the use of electronic computers; and (b) then making adjustments, if necessary, on the basis of bioevolutionary theory and its application. They claim that the procedures generally followed are incorrect, and they believe that it is necessary to set up a straw-man to be demolished. However, in the last analysis they agree that their method is quite similar to the customary Neo-Adansonian method as already indicated, but they emphaisze the use of electronic computers in making the partial correlations. The fundamental flaw in their argument is in confusing the two phases of lineagics—the basic phase (what is true in nature?) and the applied phase (what is useful?). Aside from this unnecessary effort to demolish their straw-man, the book fills a definite need, and is a necessary addition to the library of every lineagicist.—*Hamilton P. Traub*

MANUAL OF VASCULAR PLANTS OF NORTHEASTERN UNITED STATES AND ADJACENT CANADA, by H. A. Gleason and A. Cronquist. D. Van Nostrand Co., 120 Alexander St., Princeton, N. J. 1963. Pp. 810. Illus. $11.75. This is a companion volume for "The New Britton and Brown Illustrated Flora". However, in the presentation, the junior author has taken into account recent studies concerning the plants included. The book covers the vascular plants, including ferns, grasses, trees, weeds, and wild flowers in northeastern United States and adjacent Canada. This book is highly recommended to the layman, professional plant scientists, and students, including foresters, conservationists, county agents, scout masters, and the serious amateur plant scientists.

(CONTINUED on page 52.)

Herbert Medalist—Samuel Yongue Caldwell beside a group of *Lycoris squamigera* Maxim., in his garden, Nashville, Tennessee.

SAMUEL YONGUE CALDWELL

An Autobiography

What prompts a person, brought up and educated for the legal profession and following it for a time, to wander off and make a career in the completely unrelated field of horticulture, where he has no formal training at all? That query comes up sometimes at the conclusion of programs I do, which the garden club people generously refer to as "lectures."

It is not entirely facetiousness when I explain that lawyers often have to work for people who are mad at each other. They get involved in disagreements, arguments, bickering, strife and contentiousness. Horticulturists, on the other hand, work not only with plants, which are fascinating and beautiful, but also with the very nicest kind of people—gardeners—who are kinder, friendlier, more generous and more pleasant to be around than the average run of human beings.

That, of course, over-simplifies my reasons for changing vocations. I gravitated into my present work because I happen to like plants and people.

I was born November 8, 1904 on a farm belonging to my grandparents in the pleasant rural community of Brentwood, just 12 miles south of Nashville, Tennessee. My father was a doctor, and with an older brother and two younger sisters I grew up in the Nashville area. Underweight and sickly as a child, I was out of school a good deal and spent the time in the country on the farm. Fishing, hunting and keeping an odd assortment of pets—the best was a young raccoon—were chief interests. I also became intensely interested in photography—so much that when in the winter of 1918 I made "big money" selling hides of muskrats and minks trapped along a little creek in the farm meadow, I spent nearly all of it on a big, professional looking camera that made postcard size pictures on glass plate negatives.

In and out of school, as health permitted, I eventually received a Law degree from Vanderbilt University in 1932 and was admitted to the State Bar. Meanwhile, some indications of a stronger-than-average liking for plants and gardens were showing up. I ordered seeds each year from the famous old Peter Henderson and Henry A. Dreer catalogs and cultivated both flowers and vegetables with enough success to have our place included a couple of times on local spring garden "pilgrimages." New and "different" plants attracted me particularly. Aquatic plants became a major interest, and during the summer of 1928 I worked at the William Tricker waterlily nursery near Cleveland, Ohio. It was a happy time, as other nurseries of various kinds were nearby and I was constantly associated with professional plantsmen.

At summer's end I made a round-about home trip in my Model T Ford, spending several days in St. Louis, where I was thrilled to meet

in person a noted waterlily hybridizer, Superintendent George Pring, at the Missouri Botanical Garden. He was the first of many "names" I have come to know over the years in the field of horticulture, and to this day I count him a friend.

But there were many different plant interests, and amaryllids were among the early ones. During my sophomore year at Vanderbilt a lady who lived across the street from my fraternity house gave me a bulb and the most fascinating flower I had ever seen—something called "red spiderlily." I was already growing "Amaryllis hallii." Numerous descendants of these original bulbs remain with me today, but the names have been changed, for we now know them as *Lycoris radiata* and *L. squamigera*.

During the 'thirties' I practiced Law briefly, then did legal research work for our State Department of Education. Also I continued gardening and began free-lance writing for farm, garden, photographic and home workshop publications. By this time my photographs were up to professional standards and they sold many of my articles. Still underweight and never in robust health, I managed to store up extra vitality by two months of outdoor life each summer, serving as a staff member at a boys' camp in the East Tennessee mountains.

World War II brought changes. I went into the Infantry in 1942 and got basic training at Camp Wolters, Texas. There I "discovered" dozens of native wildflowers, and during ten-minute "breaks" used to gather seeds and store them in my cartridge belt to send home later. Incidentally, the showy "Texas Plume," *Gilia rubra*, did very well back in Tennessee, and in later years I was to see it thriving in Nebraska gardens.

My early liking for guns paid off in the army; I became one of Fort Benning, Georgia's "90-day-wonder" boys, was commissioned and continued until 1946, mainly as an instructor in weapons, at Infantry replacement training centers. More than two years were spent at Camp Blanding in northern Florida, and offtime hours brought opportunities to cultivate many garden-minded friends. Right at Blanding I found Major Henry R. Totten, "Mr. Botany" to Carolinians because of his long service to the University of North Carolina as head of the Botany Department. With him and Mrs. Totten I trekked the woods of Penny Farms and journeyed to Jacksonville for meetings with groups of wonderful garden club people who even during the war years gave beautiful camellia and orchid shows and planned the splendid Garden Center that was to come.

Having been a member of the American Amaryllis Society and other plant societies for several years, I knew that I was near centers of horticultural interest. I got acquainted with Dr. H. H. Hume and Prof. John V. Watkins in Gainesville, spent pleasant Sunday afternoons with John R. Heist and his bulb plantings in St. Augustine, and had stimulating visits with Wyndham Hayward and the late Ralph W. Wheeler in Winter Park. In Orlando I was awed and entranced by the hospitality of Mulford and Racine Foster; their Orchidario on Magnolia

avenue became a week-end Mecca, and I spent Christmas leave time with them in 1943, '44 and '45. Years later I was to visit at their marvelously interesting new home, Bromel-La, outside Orlando.

Thus in spite of the relative grimness of war years I began to acquire a sort of informal horticultural education "by association."

Terminal leave as an army captain in 1946 allowed me a two-month California tour which included such highlights as a visit with the late Fred Howard in Montebello—I'm still growing choice clivias selected from some 2,000 hybrids he had in bloom; a never-to-be-forgotten stop with Mr. and Mrs. Cecil Houdyshel in La Verne; seeking peak bloom on irises with the late Carl Milliken in Arcadia, and meeting J. N. Giridlian at his memorable Oakhurst Gardens, also in Arcadia.

Returning to civilian work, I knew it had to be something connected with plants, so I became associated with the American Iris Society as editor and executive secretary, at the central office, then located in Nashville. And my grandparents' farm became my own home; here there was room to grow all the shade and ornamental trees, the evergreens and flowering shrubs, the perennials and bulbs I desired. I still live there, by the way, along with my mother and an aunt; I have never married.

A neighbor and gardener friend was the late Thomas A. Williams, then doing a weekly question-and-answer session for amateur gardeners as the Old Dirt Dobber on CBS Radio's Garden Gate program. I had occasionally contributed items for Mr. Williams to use on the air, but had no idea that he had suggested me to CBS executives as a possible successor. However, in 1949 he passed away suddenly after a heart attack, and within a week I was the new Old Dirt Dobber with a coast-to-coast radio audience through more than 200 stations.

That started a hectic but wonderful ten-year period. I studied, traveled, visited gardens, asked questions and listened to plantsmen. Then on Saturday mornings I passed along to radio listeners some of the things I'd learned.

By the late 'fifties, however, television had taken over as the top medium in the broadcasting field, and big-time network radio was passing out. I went out with it.

Actually, at the present time I am doing more radio work than ever, but simply have smaller audiences. I do one program for listeners in my local area and another that is transcribed and heard in a number of states. Then I've done numerous television shows about plants and gardens, have written and illustrated a couple of small books, and as time permits I contribute occasional articles and photographs to garden magazines. Another job is acting as horticultural advisor for a chain of garden centers.

Happily, my work allows me time for a great deal of gardening "in person." I enjoy planting and growing a very wide variety of plant materials, and every season brings something new. Although not naturally a joiner, I do belong to most of the plant societies—everything from the African Violet Society of America to the Northern Nut Growers

Association. Their publications held keep me up-to-date on what's happening in the world of gardening. I've been especially close to the American Iris and American Hemerocallis societies and have appeared many times on their national convention programs; also I've been convention speaker for the peony, daffodil, rose, African violet and gesneriad societies. Attending meetings of these organizations has meant wonderful friendships with gardeners and plantsmen all over the country.

All plants interest me, but I'll admit a special feeling for the moderately rare or at least uncommon things. That probably accounts for my long-time devotion to lycorises. Their strange growth and flowering habits and unpredictability, along with great beauty in some species, make them most intriguing. Naturally it is exciting to see my new hybrids come into bloom each year.

But more remarkable than any planned progress with lycorises was my involvement in a purely accidental occurrence. Let's face it; in all the world there just aren't many dyed-in-the-wool lycoris "nuts" —people who through a lifetime go out of the way to acquire every species available. I happen to be one of them. May our small tribe increase, but meanwhile it is admitted that we are few and far between. Well, away back in 1925 the mother of a Methodist missionary stationed in Huchow, China, returned to the States, bringing along a few "spiderlily" bulbs collected from the wild in hills outside Huchow. Had the law of averages been working, these would have been any one of several nice but not uncommon bulb flowers that China has contributed to gardens. As events later proved, they were actually a type of hardy golden lycoris quite unknown in cultivation.

Again, the law of averages would have brought the good lady home to Peoria or South Bend or Binghamton, or any one of innumerable communities where no ardent lycoris fancier lived. With no one around to recognize their possibilities, the pretty spiderlilies might have remained indefinitely in obscurity.

But things didn't work out that way. By incredible coincidence this lady was from Nashville, Tennessee, my own home town, where she returned and planted the bulbs. It is true that for 33 long years we lived here—the bulbs and I—as strangers, just a few miles apart. Then in 1957 a local gardener who had seen them learned of my interest in flowers of that type and told me about them. When finally I saw a clump flowering, August 15, 1958 (see photo, page 78, PLANT LIFE 18: 1962), it was like finding fabled gold at rainbow's end. I knew from their remarkable size and beauty and their record of having lived outdoors here in a climate where sub-zero winter temperatures are common, that they were vastly different from *Lycoris aurea* grown in our Deep South—different, in fact, from any lycoris species thus far recorded. It was a thrill to photograph them and report the find to Dr. Hamilton P. Traub (see "A Hardy Golden Lycoris," page 97, PLANT LIFE 14: 1958).

This is a big and showy lycoris and may eventually be a widely grown garden subject. However it may be finally identified or named—

and we currently call it "L. sperryi" for convenience—I am happy to have had even a chance part in "discovering" a golden garden treasure.

FROM INDIA TO AFRICA AND BACK

SIDNEY PERCY-LANCASTER, *National Botanic Garden, Lucknow, India*

In February 1963 I took passage by the S. S. Karanjia, a B. I. S. N. boat, for a four month holiday in Southern Rhodesia with a view to collect my library, clothes and bring back my Gloriosa tubers, as I had decided to spend the last few years of my life in India. Bad luck seemed to have dogged my steps this trip.

The first Port we visited was Karachi, in Pakistan. I had not contacted friends in this City and therefore had to be satisfied with a quick round of gardens along the main thorofare. We sailed across to Mombasa, on the African coast where I expected to meet a friend and be taken to a Nursery 12 miles from the City. There was no sign of him and to aggravate matters, we stayed in Port two extra days—and I waited for some message. Later I heard that he had visited Nairobi and there fallen ill, returning to Mombasa only after the boat had sailed. I had picked up "flu" from a fellow passenger and was quite ill but game to go ashore. As there was no cargo or passengers for Dar-es-salaam, we went to Zanzibar and I stayed aboard. Then back across the Ocean we went to the Seychelles, here I had promised myself a walk to the Botanic Garden to photograph the Double Coconut Palms and get seeds and Gloriosa tubers. Passengers were not allowed to go ashore till after 4-30 p. m. and as it was a miserable dull day, with light showers, I stayed in my cabin. Our last Port was Beira but, though we reached on time, there was some delay that prevented the discharge of cargo and I spent another night on board. I had telegraphed my daughter-in-law telling her of my delay but rather than risk over-tiring myself in wandering about the City I spent the day at the station, which has no passenger facilities. In due time I landed in Salisbury and spent the next few months enjoying myself.

On the return trip to India, I left for Beira, on the 15th August to catch the S. S. Kampala which sailed on the 17th. We called at Mocambique but I did not go ashore, at Dar-es-salaam I walked two miles to the Public Garden, there I picked up two *Sansevieria* leaves, also seeds of a *Crinum* and of a couple of trees. Next day we were at Zanzibar and I went ashore as soon as I could, met the Director of Agriculture, was passed on to the Superintendent of Parks and Gardens, and I discovered another five new varieties of *Sansevieria* and a few other interesting plants. It was a successful visit! Mombasa was again a disappointment, the friend could not be traced while the Superintendent of Parks and Gardens was on sick leave. I was given a plan of where he lived but though I spent the next five hours discovering new parts of Mombasa I failed to find his home.

Our last Port was Mahé, in the Seychelles, and I kept my fingers crossed, would I be lucky and get what I wanted? I met the Director

of Agriculture, went round the garden, saw their wonderful collection of Palms, was able to supply names of several plants and and collected two *Crinum* bulbs and a couple of tubers of *Gloriosa superba* that might differ slightly from our Indian species. With several new *Sansevieria*, I had obtained in Salisbury, and two *Crinum* species and a *Boöphone* (Buphane) gathered from the "bundu," the wilds of the capital, as well as an assorted collection of South African bulbs, several dozen *Hemerocallis*, and a number of *Stapelia* species from Wankie, I carried two large parcels with Phytosanitary Certificates, and hoped to get through the Customs without much trouble. Fumigation was demanded and I had to submit the contents for the "death" chamber, resulting in the loss of the names of the *Hemerocallis*. I hope that what survives will give some value to my holiday!

HOLIDAY IN SOUTHERN RHODESIA

SIDNEY PERCY-LANCASTER, *National Botanic Garden, Lucknow, India*

I had an opportunity of visiting some of the "high lights" of Southern Rhodesia before I left Africa and send you a short note of the trip in case it may be of interest to your readers. To see, for instance, the Victoria Falls in an illustration is not quite the same thing as viewing it "in the flesh" and you fail to get the thrill when you come face to face with this stupendous spectacle. However I would ask you to wait a bit and hear something about Salisbury, the Capital of the Federation, where I have lived for three years. It is quite a young city, 75 years old, situated at an elevation of 5000 feet, and with seasons the reverse of those in the northern hemisphere. Traffic is entirely motorised, the roads excellent, precautions against overspeeding in the city are numerous, and attempts to "keep the city clean" are very successful. Salisbury has the largest Sales centre, in Tobacco, in the world, and in the busy season 700 to 800 bales of tobacco leaf are auctioned *every hour!*

This trip was undertaken really at the wrong time, from an horticultural point of view for it is winter at this time of the year,—July-August—and everything was drab and dry, only a little colour from the aloes and not many autumn tinted bushes, or trees. We passed through Bulawayo to pick up food for our stop at the Matopos, for though one can hire the huts at the camp, there are no arrangements for meals. We spent two days at the Marleme Rest Camp, saw the small Game reserve, the Dam, and drove along the main drives. Two caves were visited with rock paintings, both very exposed to the weather, and dating back to 40,000 B. C. for the first occupants and to 1 A. D. for the last. The floor of the huts was wood ash, 14 feet deep. The chief attraction was the tomb of Cecil Rhodes, and near by lie two other pioneers. A Memorial is raised a little distance away to 33 soldiers who were killed in an attempt to arrest the Matabele King who had

stirred up rebellion. The Matopos are a low range of hills, composed of large blocks of rocks, some precariously balanced; in some places the hills are densely covered with vegetation, in others a "rock" scape meets the eye with huge euphorbias. All rivers I noticed on the trip were named; some were dry, others carried a trickle of water and very few could be called streams. The roads are excellent; every few miles there are "Lay by's" where, in a deep bay of the road, motorists can stop. There are no shade trees, or shelter, but every bay has a blue painted drum with LITTER in large letters! The injunction to "Keep the City clean" seems to have been extended to the country-side! Our next stop was Wankie, the National Game Reserve and as we could not get accomodation in the Rest Camp we had to stop at an Hotel in Dett, 15 miles away. I was very unfortunate with my camera, three films, used for scenes at the Matopos and at Wankie failed—24 snaps —because I had been supplied with the wrong class of film. At Wankie the animals were decidedly inquisitive; they did not bolt when the car drove by (25 miles per hour is the speed limit); they stood, and stared, and then quietly melted into the light forest background. The deer walked a few paces into the tall grass and disappeared. Elephants were everywhere—we were held up by a pair on one occasion while they indulged in a dust bath, they saw the car but blocked the highway; when we drove on after they had given us a clear passage, we met a herd of some 50 elephants that had crossed the road and left these two loiterers behind! Then another experience was when we were compelled to stop as there, on the drive, lay five young lionesses, in cat like attitudes, after a heavy meal off a Gnu (wildbeest). They were perhaps 20 feet from the car, but not nine feet away two other lionesses tore the last hunk of meat off the bones of the Gnu. They were too busily engaged to worry about the spectators! Buffaloes looked terrifying, they were always in large herds of 50 or more. At the observation Post animals came morning and evening for a drink and we saw zebra and giraffe in company, buffalo in herds but what was most interesting was a herd of elephants from the tiny toddlers to old stagers. After the drink there was a little horse play—rather elephant play!!—pushing and squirting of water over each other. The number of animals that you see on a trip depends on the season, and your luck, we saw the following numbers, an approximate guess, for many more may have been in the background of the herd: Elephants, 200—Gnus (wildbeest), 500—Buffalo, 400—Deer of at least a half a dozen species, 200—Zebra, 100—Giraffe, 80—Apes and Baboons, 100—Warthogs, 60—Lions, 19—Lionesses, 8—Ostrichs, 40—Hyenas, 3—Rhinoceros, 1—and birds in great variety. The area of this Game reserve is about 30,000 acres, there are 14 dams and water pans in different places. It is estimated that there are 4500 elephants alone in the Game Reserve and other animals must be in like proportion.

From Wankie we drove to the Victoria Falls, arriving late in the evening and restraining our impatience to see the actual Falls, we walked from the Rest Camp to the banks of the placid Zambesi, saw

the immense plumes of spray and retired. Next morning, after a meal, we drove to the Falls and walked down to the Eastern Cataract. When faced with the real Falls you stand with your emotions, more or less paralysed. Your admiration of the beauty gives place to the awe of the spectacle and this is followed by fear while you take especial care that you do not take that fatal step and end up 300 feet below in the 200 feet wide chasm! So many have tried to snap some particular sight, and—failed!! The river only loses control of itself about 100 yards from the lip, then in a fury, with wild tossed mane, the river leaps into the chasm, sending up a spray cloud 1000 feet high or more. To get a photograph of the entire Falls is all but impossible, even at this season, with the river at its lowest one would have to wait till the spray was blown aside. The Victoria Falls are one and a half times as wide and twice as high as Niagara, the figures for the quantity of water that goes over the lip every minute and what it weighs did not interest me as much as the actual sight. There is a strip of land on the opposite side of the Falls, called the Rain Forest, most of the area is bare of even bushes though there are trees in the background, but the spray from the Falls which varies from a "Scotch mist" to a light shower, keeps this spot wet all the time. I noted patches of *Gladiolus primulinus*—and the capsules contained germinated seeds, some seedlings 2 to 3 inches long, *Haemanthus multiflorus* was in leaf, there were many tangled masses of *Solanum seaforthianum, Lantana camara, Plumbago zeylanica,* and the ubiquitous *Ageratum mexicana.*

Boababs are a feature of this part of Africa and while trees with a diameter of 10 to 12 feet are common one near the Victoria Falls is 22 feet in diameter! I have seen in Mombasa, specimens up to 18 feet.

From Victoria Falls we went to Livingstone, seven miles away, first for a two hour trip up the Zambesi, then to a Model Craft Village with many interesting exhibits, and finally to the Rhodes—Livingstone Museum which displayed in addition to relics and mementoes of these two great men exhibits of the Bantu people who inhabit the Rhodesias, their customs, implements, clothing, etc. I might here mention that their wood carving is very well done and the Curio sellers do a roaring trade in all tourist centres; the Curio sellers at the Falls have excellent representations of wild animals—though some exaggerated peculiarities make the poor animal a caricature of itself.

We travelled to Lusaka, the Capital of Northern Rhodesia, on our way to Kariba which has been called "the most ambitious engineering scheme". This immense man-made lake imprisons the Zambesi and releases a miserable stream from the base of the Dam. It has been calculated that at flood tide, when the six gates release water, the volume is more than that of the Victoria Falls. Unfortunately not one gate was discharging when we were there. As far as the eye can reach is one stretch of water.

From Kariba we drove back to Salisbury where we stopped over Sunday and Monday, looked over Ewanrigg again and left on Tuesday

for Umtali on the Portuguese border of Mocambique. From here onwards to Cashel, where we stopped the night at the Black Mountain Inn, the weeds were very beautiful and I noted a *Melastoma*, very near *Tibouchina semi-decandra* but slightly paler and carrying bunches of flowers, a *Hypericum*, *Iboza* in white and two shades of mauve, *Leonitis* in addition to the normal orange, white and pale salmon pink, and many of the *Labiateae*. The scenes were beautiful in spite of the fact that in the first 36 miles you encountered 800 curves and bends! We passed over the Birchenough Bridge, the third largest single span Cantilever Bridge in existence! Then to Fort Victoria which we bypassed so as to get to Zimbabwe before it became dark. It was now 4:30 p. m. and Zimbabwe was only 17 miles away. The car was parked at the base of the hill and I started up the slope which had steps, with a two-inch rise, but had to stop three times for breathers!—blowing like a porpoise—! We looked over the stone work, the original wall made up of neatly dressed stone tiles laid without mortar and fitting perfectly. Other repairs, and walls, were not so well done. The general theory is that the ancestors of the Bantu built Zimbabwe but that a race, who since time immemorable have built daub and wattle rondavels, should suddenly develop a genius for building quite a distinct type of building—with stone, perfectly dressed and with no practice, seems a little incredible.

This was the end of the trip and I said goodby to my son and family who drove down to their home in East London; the following day I was taken by a friend to Salisbury.

I could have amplified the article by relating incidents that have been omitted owing to lack of space.

1963 TRIP TO THE MEXICAN WEST COAST

KATHERINE L. CLINT, *Brownsville, Texas*

Although we had heard of "*Zephyranthes*" *tepicensis*, it was only vaguely and we knew very little about it. During conversation with Drs. Walter S. Flory and R. O. Flagg while on a trip through Mexico with them in 1961 we learned that this species reportedly "had no tube." My interest quickened—"Why, that sounds like *Habranthus!*" None of us had seen the species but were now headed for the area where it was discovered: the "Territory of Tepic," for we were driving from Guadalajara through Tepic to San Blas, on the Pacific. It was a disappointing trip insofar as *Zephyranthes* were concerned, for it was bone dry all the way to the Pacific. Just north of Tepic, we questioned a nurseyman about *Zephyranthes* and *Hymenocallis* and were told that they both bloomed with the "first thundershowers, about the first week in July." We left our name and import number and asked that he collect some of both bulbs and send them to us, but he never bothered to do so.

Subsequently, Drs. Flory and Flagg received one bulb of "*Z.*" *tepicensis*, bloomed it and in April, 1963 sent it on to us. It was a

small bulb with very narrow, fine leaves. Surely this is not *Habranthus,* I thought. Yet when the bulb bloomed, the small, delicate flowers certainly looked like *Habranthus* to me. One lone bulb plus a small offset (more or less on loan) and a few tiny seedlings were wealth indeed, but the itch to collect the species in its native habitat was too great to ignore, so our 1963 trip to Mexico was planned and timed with this the prime objective. Available weather data and collecting dates from Herbarium data supplied by Dr. Flory seemed to coincide with the information supplied by the nurseryman near Tepic.

It was decided to drive from Brownsville to Mazatlan via Saltillo, Torreon and Durango, then south along the coast through Tepic and on into Guadalajara. We left Brownsville on July 9. Our first misgivings came when we noted signs of long and abundant rainfall just west of Durango. With the appearance of *Milla biflora* in abundant bloom we knew that chances of finding any of the *Zephyranthes* or their kin in flower was mighty slim. However, Durango rains began in June, so perhaps it will be dryer as we go west. Instead, it was greener! When we turned south from Mazatlan, we were again optimistic that we might find it dryer farther south, but it was greener than ever. In Tepic we learned that normally the first showers appear about May 15, with the "rains" starting around June 15, instead of the first of July. This year they had arrived even earlier. In spite of this knowledge, we actually did not give up hope of finding *H. tepicensis* in leaf until we were almost into Guadalajara, for Morris can spot rain lily leaves no matter what odds are against him.

This great disappointment did not keep us from enjoying the things we did find in bloom: *Hymenocallis horsmanii* (?) was heavily in bloom from Mazatlan almost into Guadalajara. Primarily an upland species, flowering bulbs were seen in almost every conceivable environment and from elevations of 300-400′ up to 4500′ or more: on low ground in a *Sabal rosei* thicket, growing in standing water in a low bar pit below the highway, on sloping pastures, on mountain ledges, on high banks of small, seasonal streams. One of the strangest sights was a small, sugar-loaf hill which was a mass of white from top to bottom. *Milla biflora* was much in evidence everywhere. We saw *Bessera* in bloom for our first time, lovely violet purple ones on a hill not far from Mazatlan, the usual red ones farther south and east. A sight we shall long remember was the picture of the blooming of a small blue and white irid, literally covering the landscape. Just before entering the state of Jalisco we ran across a thrilling sight: a small rocky gully with clear, running water literally choked with bulbs of our *Hymenocallis* No. 658. The open flowers had been ruined by rushing floodwaters the night before. We had originally collected this species in 1955 northeast of Guadalajara in a similar rocky stream. We wondered if we should also find our *Hymenocallis* No. 604 in bloom. We did find them in some number, but not until the next day, north and east of Guadalajara. Apparently, No. 604 does not extend into the western Sierras, nor did we find *H. horsmanii* east of these same Sierras. These

two species are slightly similar in leaf and bulb, but when found in bloom one could never mistake them for the same species.

As we left Guadalajara (via Mexico 110 to Irapuato, thence on Mexico 45 to Queretaro) we soon entered the area we considered home base for *Zephyranthes*, Central Mexico, and we began to find *Zephyranthes* once more—in leaf only, for the season was long over. Even in this territory we found many former collection spots completely barren of *Zephyranthes* above ground.

The final highlight of the trip was finding the blue cenizo in bloom near Cuidad del Maiz. It was a beautiful sight. A different species from those seen in Texas and north Mexico and very rare, these compact bushes were masses of true royal blue flowers. More important, bloom had been under way long enough for a few ripe seed to be found. Thus, each trip has its compensations.

IN MEMORIAM—GEORGE HOWARD HAMOR (1887-1962)

The members will be saddened to hear that George Howard Hamor died at Homestead, Fla., May 9, 1962. He was helpful to the other members of the Society in obtaining stock of *Zephyranthes bifolia*, and he was the first to establish the native habitat of this species (see Herbertia 9: 60—62, 1943). He also contributed notes on *Pyrolirion flava* (see Herbertia 12: 136—137, 1945). See Brittonia 5: 204—207, with portrait, 1963, for a brief biography.

IN MEMORIAM—WILLIAM P. BAIN

We are sad to record the death of William P. Bain on December 3, 1962, at Mobile, Alabama. He was an accredited Official Amaryllis Judge, and a great amaryllisarian who worked with his wife on the favorite plants for many years. At his death they were cultivating about 300 potted Dutch named hybrids. His widow, Mrs. Bain, will carry on with Amaryllis.

MRS. A. C. PICKARD HONORED

In 1957 the Houston Amaryllis Society was organized with Mrs. A. C. Pickard as founder and first president. The objectives of the Society are "Knowing, Growing, Showing and Sharing." The activities of the Society have very greatly stimulated interest in Amaryllis in the Houston area. Realizing that Mrs. Pickard has been responsible in great measure for this progress in the appreciation of Amaryllis, she was awarded a Life Membership in the Houston Amaryllis Society and a handsome engraved bronze plaque for her loyalty and faithful service to the organization in 1963.

Mrs. Pickard is the Official Amaryllis Instructor for the Houston Area, and has formed the Houston Council of Judges for the Houston Amaryllis Society. Mrs. Pickard is also a member of the National Amaryllis Judges Council, which includes the Official Amaryllis Judges from all the regions of the United States. In recognition of her services on the National level, the other members of the Houston Amaryllis Society voted her a Life Membership in the American Amaryllis Society, which is affiliated with the American Plant Life Society.

Fig. 2. Presentation of the 1963 William Herbert Medal to Mr. W. D. Morton, Jr., by Mrs. A. J. Haydel.

PRESENTATION OF HERBERT MEDAL TO W. D. MORTON, JR.

Mr. W. D. Morton, Jr., Registrar of the American Amaryllis Society, which is affiliated with the American Plant Life Society, was presented the Society's William Herbert Medal for 1963 for his outstanding contributions toward the advancement of Hybrid Amaryllis as reported in the 1963 Amaryllis Year Book.

The award was made at a dinner in Lenfant's Restaurant sponsored by the Garden Circles Amaryllis Club, Saturday night, Jan. 20, 1963, which was also attended by members of the Men's Amaryllis Club of New Orleans. Mrs. A. J. Haydel, a national amaryllis judge, and former president of the Garden Circles Amaryllis Club, made the presentation. She also read the citation from National Headquarters of

the American Amaryllis Society, affiliated with the American Plant Life Society.

TRAUB'S "THE GENERA OF AMARYLLIDACEAE"—A REVIEW

WYNDHAM HAYWARD

An essential tool for the advanced research worker and a helpful and interesting guide for the amateur fancier in the Amaryllis family of bulbs has at long last arrived in Dr. Hamilton P. Traub's new monograph on "The Genera of Amaryllidaceae." (American Plant Life Society, Box 150, La Jolla, Calif., 1963, 85 pages, paper-board covers, price $5.00.)

It is no discredit to Dr. Traub to say that this work is long overdue, has been for many years, in fact is the only monograph on the Amaryllids in English since Baker's "Handbook of the Amarylleae" published in 1888, now long out of print and very scarce, occasionally found in European catalogues at $25 per copy or more. It supplants, of course, the Pflanzenfamilien monograph in German on the Amaryllidaceae by Pax and Hoffmann, latest edition, about 1930.

No complete monograph of *Amaryllidaceae*, species as well as genera, has been attempted since Baker's Handbook, and that is one of the next things on Dr. Traub's agenda, as he has recently outlined. Besides the Pax-Hoffmann work and Baker there is only William Herbert's limited volume on the Amaryllidaceae which appeared in 1837.

This new "Genera of Amaryllidaceae" is the fruit of half a century of Dr. Traub's study, wisdom and judgment in the field of his favored bulb family. The grouping of this family which he has presented in this work provides the most modern and scientifically conceived treatment of this horticulturally important segment of plant life, and will raise the eyebrows of even the most up-to-date taxonomists in some regards. It will furnish the means to a better understanding of the relationships within this major family for the new student as well as explaining many perplexing problems which the veteran trained plant scientists have encountered. One may say that a true and logical concept of modern Amaryllis family fundamentals cannot be reached without reference to Dr. Traub's latest work.

EDITOR'S MAIL BAG

Mr. James T. Potter, 18 Rowan Place, Doubleview, Western Australia, writes under date of May 5, 1963, that he is interested in the breeding of *Amaryllis* and other amaryllids, and would be pleased to correspond with breeders in the United States and elsewhere. He is interested in exchanging Blandfordias and other Australian wild flowers,

and various amaryllids which he has under culture, for *Amaryllis* and other amaryllids.

Your editor enjoyed a visit from Mrs. Walter D. Wells, Sr., Houston, Texas, of the Greater Houston Amaryllis Club; and Mrs. Esther Harris, of Riverside, Calif., on July 8, 1963.

Dr. Paul Carpenter Standley, born 1884, noted authority on the tropical flora of America, died June 2, 1963, at Tegucigalpa, Honduras.

IN MEMORIAM—CECIL AND ETHEL O. HOUDYSHEL

It is with the deepest sadness that we report the death of Cecil Houdyshel and his wife, Ethel O. Houdyshel. Mr. Houdyshel died on Thursday, May 7, 1964; his wife had died on February 17, 1964. Mr. Houdyshel received the WILLIAM HERBERT MEDAL in 1938 (see HERBERTIA 1938, pp. 70-75, for his biography).

The members will be pleased to hear that Mrs. Virginia L. Richter, Mr. Houdyshel's grand-daughter, and her brother, Mr. Gordon W. Brooks, will continue the Houdyshel business uninterrupted at 1412 3rd St., La Verne, Calif. Mrs. Richter reports that they will miss her grand-father's ready wit, advice and knowledge.

LINEAGICS

"Lineagics", by Hamilton P. Traub, 145 pages, 8 illustrations, $5.00 postpaid, is now available. This is a brief outline text which was prepared for those members of the Society who are interested in what was formerly known as biosystematics, the science concerned with the grouping of organisms into lineages. The text is divided into four parts: (a) the history of lineagics, and lineagics as an integrated science; (b) basic lineagics; (c) applied lineagics, and (d) research methods in lineagics. This outline text may be obtained from the Executive-Secretary, Dr. Thomas W. Whitaker, Box 150, La Jolla, Calif.

1. REGIONAL ACTIVITY AND EXHIBITIONS

THE PALESTINE (TEXAS) AMARYLLIS SOCIETY

MRS. ARCOLA N. HERRINGTON, *Secretary*

The Palestine (Texas) Amaryllis Society was organized as an affiliate of the American Amaryllis Society on January 8, 1963 with five members which has grown to ten members at this writing (Aug. 18, 1963).

The members meet every first Tuesday at 3 p. m. at the home of one of the members. At each meeting the topic for discussion is some phase of Amaryllis breeding and growing. Light refreshments are served. During the autumn we will have speakers at some of the meetings. We study the Amaryllis Manual by Dr. Traub, and follow the directions given by various dealers in Amaryllis. We have completed our new Year Book and these will be presented to each member. We are enthusiastic about our future plans.—*839 Tennessee Ave., Palestine, Texas.*

SAN ANTONIO JUDGES COUNCIL ORGANIZED, 1963

Mrs. Robert E. Herold, 203 Cromwell Dr., San Antonio, Texas, reports that the San Antonio Judges Council of Nationally Accredited Amaryllis Show Judges was organized on September 24, 1963; Pres., Mrs. Edward Story, V-Pres., Mrs. Robert E. Herold, Sec.-Treas., Mrs. Robert H. Parkinson. She also reports that an Amaryllis Society will be organized on a later date.

HATTIESBURG AMARYLLIS SOCIETY

MRS. R. A. FOWLER, *P. O. Box 670, Hattiesburg, Mississippi*

Our Amaryllis Show had to be canceled on account of the severe winter weather which damaged many of our bulbs. We are planning an Official Show for 1964. We have learned much about overwintering Amaryllis bulbs as a result of the extreme cold weather of the past two winters.

1963 AMARYLLIS SHOWS

In spite of the severe cold weather of the past two years, most of the local Societies were able to hold creditable Official Amaryllis Shows in 1963. These are grouped in the order in which they were held from March 30 to April 27-28.

OFFICIAL MEN'S AMARYLLIS CLUB SHOW, 1963

WALTER R. LATAPIE, *Show Standards Chairman*

The Men's Amaryllis Club of New Orleans held their Sixth Annual Show on March 30th and 31st, 1963. In spite of the second severe winter in the City of New Orleans large quantities of Amaryllis were exhibited. Comments continue to come in, indicating that we had again scored a huge success for our efforts.

Fig. 3. Partial view of exhibits at the 1963 Official Men's Amaryllis Club Show, New Orleans, La.

Registered attendance was in excess of 600. As in the past, a number of out-of-town visitors also enjoyed our flowers. They came from Baton Rouge, Prairieville, Hansville, Luling, Thibodaux, Raceland,

Belle Chase, Bastrop, Shreveport, Covington, Destrehan, Port Sulphur, in Louisiana. From out of the state, Amaryllis lovers came from Mobile, Ala., Gautier, Miss., and Dothan, Ala.

Awards in the horticulture section were received by: A. J. Haydel, the Jessee Nursery award, Tri-color winner in Dutch Hybrid class; Melvin Zwicke, the Reuter Seed Co. and T. T. Swetman trophies for sweepstakes in Dutch Hybrid class; Mrs. John Klein, Jr., Newsham Becnel Tri-Color winner in American; Stephen Gaspereez, The Men's Amaryllis Club award, most blue ribbons won by a member; and Santo Cuchinotto, sweepstakes winner, most blue ribbons, American.

Awards of Merit of the American Amaryllis Society were received by: Jerome E. Peuler, 'Love's Desire'; Melvin A. Zwicke, 'Golden Triumphator'; Melvin A. Zwicke, 'Siren'; Mrs. John Klein Jr., 'Halley' and Stephen Gaspereez, 'Little Sweetheart'.

Preliminary Commendations were awarded to: Milo C. Virgin (2), Mrs. Walter Gonzales, and Stephen Gaspereez.

Mr. Frederic Schmitz, Assistant Professor of Horticulture, Plaquemine Parish Experimental Station, Diamond, La., showed colored slides and held discussions on Amaryllis during the afternoon of Sunday March 31st.

Chairman of the Show was Vincent J. Peuler, and Co-Chairman was Barry W. Clark.

1963 COASTAL BEND AMARYLLIS SHOW

MRS. CARL C. HENNY, *P. O. Box 3054, Corpus Christi, Texas*

The Coastal Bend Amaryllis Society held their annual show in conjunction with the Lola Forrester Flower Show, in Corpus Christi, Texas, March 30th and 31st, 1963. The Theme of the flower show was "Heaven's Above—Zodiac".

Mrs. Rudolph Studer, staging chairman for the Amaryllis Society, prepared twelve posters depicting all the signs of the Zodiac, with planting instructions for each period of time. She also displayed large oil paintings of several types of hybrid amaryllis which helped to make the display more attractive. Mrs. Studer, being an artist, painted these pictures in oil from slides which were taken of the amaryllis while in bloom.

Mrs. L. Materne was awarded the (Ludwig Cup) Ludwig's Challenge Trophy for her display of Ludwig's Streaking Stripes—potted bulb—which received the highest score in the potted plant section of the Ludwig bulbs exhibited. Mr. Reed Rogers received a Silver Trophy for 'Ludwig's Dazzler', highest scoring cut scape in the registered amaryllis section.

Only 94 specimens were entered this year, due to reverse weather conditions in this area. Corpus Christi suffered five northers of freezing and below freezing temperatures, which damaged and retarded many of our plants. Therefore, our society did not have National Judges

to attend the show to judge our specimens, as there were few which were worthy to be judged. Local judges judged our entries for the show. We hope that we will have better luck with our entries during the coming year—spring 1964.

FIRST OFFICIAL SHOW, GREATER HOUSTON AMARYLLIS CLUB 1963

MRS. W. S. WHEELER, *President, 4506 Bellaire, Bellaire, Texas*

The Greater Houston Amaryllis Club of Houston, under the chairmanship of Mrs. Walter D. Wells, Sr., presented its First Annual Amaryllis Show of April 6-7, 1963 in the Garden Center.

The theme of the show was ''Amaryllis on Tour'' honoring our neighboring Gulf Coast clubs.

Seven arrangements were displayed on pedestals by:

Mrs. Jesse Haver, honoring Corpus Christi, ''Sailing Sailing''
Mrs. B. A. Russell, honoring Dallas, ''Big D''
Mrs. Z. K. Toliaferro, honoring Hattiesburg, Miss., ''Plantation Days''
Mrs. Walter D. Wells, Sr. honoring Mobile, Ala., ''A Southern Port''
Mrs. Henrietta Taylor honoring New Orleans, La., ''The Crescent City''
Mrs. R. C. Willie, honoring San Antonio, Texas, ''A Japanese Garden''
Mrs. Clint R. Black, honoring Valdosta, Georgia, ''Southern Hospitality''

All arrangements were made using one or more amaryllis. They added much beauty to our show.

The judging was done by official Amaryllis judges, and ten silver trophies were awarded to exhibits that merited them. Award of Merit for 'Floriade' (Warmenhaven), the most outstanding potted horticultural specimen of the show, was made to Mrs. Walter D. Wells. Also, a silver trophy was awarded to Mrs. Wells. Other top awards were made to Mrs. W. S. Wheeler, Mrs. Clint R. Black, Mrs. R. A. Fawcett and Mrs. Charles Pease.

An important non competitive feature of the show was the educational display on the growing of *Amaryllis* from clone with ripened seed pods to blooming clone step by step. This display created quite a lot of interest and comments from the newly interested public. Members of our organization gave first hand information to our interested guests on buying, and from what nursery in Holland the bulbs may be purchased.

Amaryllis lover members of Amaryllis clubs from cities in the surrounding area, along with many local enthusiasts, viewed the show and expressed their pleasure and congratulations for one of the outstanding amaryllis shows in Houston.

GARDEN CIRCLES AMARYLLIS CLUB OFFICIAL SHOW, 1963

MRS. A. J. HAYDEL, *516 Gordon Ave., New Orleans, Louisiana 70123*

The Garden Circles' Amaryllis Club of New Orleans is affiliated with the American Amaryllis Society, also a member of The Federated Council of New Orleans Garden Clubs, The Jefferson Parish Council of Garden Clubs and the Louisiana State Federation of Garden Clubs.

Fig. 4. Presentation of the Tricolor Award to Mr. James E. Mahan by Mrs. A. J. Haydel at the 1963 Official Amaryllis Show of the Garden Circles Amaryllis Club.

Mrs. A. J. Haydel was show Chairman, Mrs. John Klein, Jr. was honorary Chairman.

The show was judged by accredited Amaryllis judges.

The Garden Circles' Amaryllis Club sponsored the Official Horticulture Amaryllis Show at Reuter's Seed Co. 320 N. Carrolton Ave. The

show was opened to the public Saturday April 6 from 3 to 5 P.M. and Sunday April 7 from 8:30 A.M. to 5 P.M.

The Tri-Color was won by Mr. James E. Mahan on his "Queen of the Pinks". Another top winner in the show was Miss Antoinette Weed who won the Harry St. John award for the most outstanding registered American Specimen. Mr. Santo Cuchinatto, recipient of the Sweepstake award for the most blue ribbons in the American Horticulture Division. Mrs. Walter R. Latapie won the sweepstakes award in the Dutch Horticulture. Mrs. Harry St. John for the best American Seedling.

The Preliminary Commendation Awards from the American Amaryllis Society went to Mrs. Harry St. John, Mrs. A. J. Haydel, Mrs. Lewis Lloyd, Mr. Milo C. Virgin and Mr. E. M. Beckham.

The Awards of Merit from The American Amaryllis Society went to Mrs. A. J. Haydel, Mr. James E. Mahan, Mr. Melvin Zwicke and Mr. E. M. Beckham.

Blue Ribbon winners in Dutch Horticulture were Mrs. Miriam G. Authement, Mrs. A. Autry, Mrs. A. J. Haydel, Mrs. Harris Hebert, Mrs. John Klein, Jr., Mrs. Walter R. Latapie, Mrs. Lewis Lloyd, Mr. A. R. Oddo, Mrs. W. J. Perrin, Mr. E. M. Beckham, Mr. Barry W. Clark, Mr. James E. Mahan, Mr. George Mertz Jr., Mr. Milo Virgin and Mr. Melvin Zwicke.

Blue ribbon winners in the American Horticulture Division were Mrs. Harris Hebert, Mrs. John Klein Jr., Mrs. Miriam G. Authement, Mrs. Harry St. John, Mrs. Walter R. Latapie, Miss Antoinette Weed, Mrs. Charles F. Durr, Mr. Santo Cuchinatto and Mr. Toby Mullen. Entry was open to all Garden Clubs and Non Gardeners.

There were six invitational arrangements displayed on pedestals by non-competitive guest artists who were Mrs. V. P. Grundmann, Mrs. F. J. Cuguet, Mrs. Robert Larue, Mrs. Russell Kullman, Mrs. Wayne E. Williams and Mrs. Tully Ward.

There were 250 entries in Horticulture and over 750 attended the show. There were a number of visitors from out of State.

The all Horticulture Amaryllis Show of New Orleans was displayed by Divisions 1 to 9 and by Growers.

VALDOSTA (GA.) OFFICIAL AMARYLLIS SHOW, 1963

GUY RICE, *606 Gornto Road, Valdosta, Georgia*

The Official Valdosta Amaryllis Show of 1963, sponsored by the Men's Garden Club of Valdosta, was held on Saturday-Sunday, April 20 and 21, 1963. Mrs. Richie Rosa of Tallahassee had the best horticultural entry—a huge pot of white Amaryllis in full bloom, which was held at the Valdosta Garden Center auditorium. This is the 7th show staged in cooperation with the American Amaryllis Society.

The judges were well pleased with the quality of the Show in spite of the fact that due to the severe cold of the past winter many fine

bulbs had been lost. There were not as many entries under named clones, but the quality of all of the blooms was excellent. Growers from several south Georgia and north Florida cities brought their blooms to the show.

Winners in the Court of Honor, the top entries were, in addition to Mrs. Rosa, William Hart, with 'Picotee' for the best named clone in a pot; Mrs. Willis Register, with a light red bloom in a pot; Mrs. Mary Newton, with a red bloom with star in a cut scape; Dr. Gregg Smith, with a white with red stripe for the best entry in the hybridizer's class, cut scape; and Mrs. Leonard Mederer, with an orange red seedling, for award in hybridizers class, in a pot.

Many other blue ribbons were awarded. Robert D. Goedert, of Jacksonville, Fla., received a green ribbon for his outstanding commercial exhibit.

1963 OFFICIAL HOUSTON AMARYLLIS SOCIETY SHOW

MRS. A. C. PICKARD, *Official American Amaryllis Society Show Standards Chairman, 1702 N. Blvd. Houston 6, Texas*

The spacious Houston Garden Center auditorium was turned into an Amaryllis heaven on April 21, as more than 1000 Sunday visitors toured the Third Official Show of the Houston Amaryllis Society.

Fig. 5. Trophy table and winning award specimens at the 1963 Official Houston Amaryllis Society Show.

Modern arrangers interpreted the theme of the show "Forecast of the Amaryllis" with five classes, namely "Signs of the Zodiac," creating exciting experiences in color sensation with Amaryllis flowers predominating.

There were invitational classes in Artistic and Horticulture classes. This was a standard competitive specialty show, judged by National Accredited Flower Show Judges in the Artistic Division, and the Horticulture sections judged by Accredited National Amaryllis Judges.

The Educational section included the Life Cycle of *Amaryllis* from seed to clone and all methods of vegetative propagation with examples of planting and information thereof.

Five American Amaryllis Society awards in Horticulture were awarded to the meritorious exhibits. In addition to the ribbon and awards of merit, five silver perpetual trophies were awarded to their winners. These trophies are perpetual and may be kept permanently by exhibitor when won two (2) consecutive years or three (3) times at intervals.

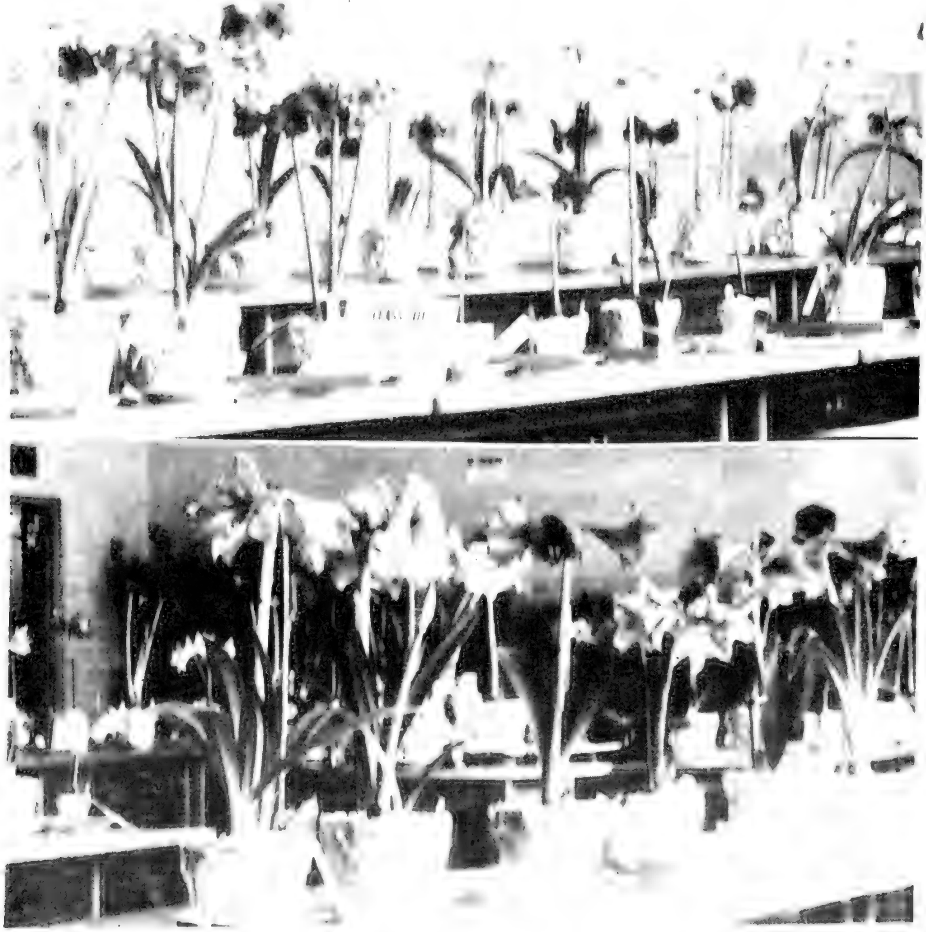

Fig. 6. Partial view of exhibits at the 1963 Official Houston Amaryllis Society Show.

Top award winners were Mr. Kermit Warnasch, Mrs. A. C. Pickard, Mrs. M. E. Shelton. A number of blue ribbons were given in the different divisions and classes as the Houston Amaryllis Society followed the official rules of the "American Amaryllis Society."

Awards of Merit and Preliminary Commendations were given as follows: 'Anna Paulowna' (WSW), A. M.; 'Beacon' (Warm.), A. M.; and 'Bouquet' (Lud.), A. M., Mrs. A. C. Pickard; 'Home Decorator' (Lud.), A. M. & Ludwig Cup, Mrs. M. E. Shelton; 'Marion' (WSW), highest A. M., Mr. Kermit Warnasch; 'Sight Show' (Lud.), A. M., and 'Superba' (VM), A. M., Mrs. A. C. Pickard; and Breeders Class, Dutch Seedlings, P. C., Mr. Kermit Warnasch.

In the Artistic division, Mrs. C. R. Swanson took top honors with Mrs. W. L. Offenbacher second. Guest entries were given special awards.

Mrs. W. W. Cone, General Show Chairman, was elected President for 1964.

11th OFFICIAL GREATER GULF AMARYLLIS SHOW, 1963

WILMER R. SMITH, *General Show Chairman, Mobile, Alabama*

The Amaryllis Society of Mobile staged their Eleventh Annual Greater Gulf Amaryllis Show April 27 and 28, 1963 in Mobile, Alabama. This is an Official Amaryllis Show staged under the standards of the American Amaryllis Society.

The theme of the show was "Amaryllis On The Gulf" which was carried out by having a large sail boat surrounded by baskets of *Amaryllis* as the focal point.

Entries in the show were as follows: American Potted Amaryllis, 48; American Cut Amaryllis, 59; Dutch Potted, by color, 12; Dutch Potted by name, 68; Dutch Cut, by color, 28; Dutch cut by name, 23; Seedlings, potted, 32; Seedlings, cut, 27; and the following single bloom Amaryllis: Dutch by name, 36; American by name, 13; Unnamed Dutch, 22; Unnamed American, 74. Hobby Tables 3. This made a total of 445 entries in the Horticulture Division. We also had 46 Artistic Arrangements and 27 Art Entries. These entries made a grand total of 518 entries in the show.

The show also had four educational tables which created a great deal of interest. Attendance for the two days was well over 3,000 which included many visitors and friends from nearby towns and cities. One thousand program books were given away.

Another feature which was repeated this year was that people attending the show could deposit self-addressed stamped envelopes for free seed when it was ready. We have mailed over four hundred of these envelopes and each one contained several dozen seed. Our program states the object of our show is to present a competitive display of *Amaryllis* that will stimulate and broaden interest in their growth, and to encourage those attending to grow and propagate *Amaryllis*

for their enjoyment and cultural benefit. We feel that by giving the seed this helps to carry out the object of the show.

This year we included another new section and that was the Single Bloom Amaryllis, with four classes, Dutch by name, American by name, Unnamed Dutch and Unnamed American. This added interest and we believe it will be even larger next year.

Eighteen accredited judges from Hattiesburg, Mississippi, Pensacola, Florida and Biloxi, Mississippi judged the show, and a total of twenty-two sterling silver awards were made. Mr. W. C. Strain acted as Master of Ceremonies and after making appropriate opening remarks assisted Mrs. A. B. Palmer, Chairman of Awards & Trophies in making the awards to the following:

Mrs. Gertrude Marshall of Gautier, Miss., was sweepstakes winner having won nine of the awards. Of the nine awards three were won by Mrs. Marshall for the third time and therefore became her permanent trophies. Her awards were as follows: winner of the most Blue Ribbons in Show, including Horticultural & Artistic Arrangment Divisions; most Blue Ribbons in Horticultural Division; most Blue Ribbons in Dutch Named Varieties, most Blue Ribbons in Single Bloom named Division; most Blue Ribbons in Combined Dutch Hybrid Potted & Cut Amaryllis Divisions; most Outstanding Horticultural Potted Bulb Specimen of Dutch Amaryllis in Show; most Blue Ribbons in Dutch Hybrid Potted Amaryllis Division; most Outstanding Horticultural Cut Specimen of Dutch Amaryllis in Show; most Blue Ribbons in Dutch Hybrid Cut Amaryllis Division.

Mrs. Palmer awarded trophies to other winners as follows: Mrs. J. C. McRae, winner most Blue Ribbons in Artistic Arrangement Division. Mr. Joe Brummitt, most Outstanding Horticultural Potted Bulb Specimen of American Hybrid Amaryllis in show. Mrs. W. A. McCollum, most Outstanding Artistic Arrangement of Amaryllis in Show. Mrs. Virginia Sherwood for best Painting of *Amaryllis* (Adult Division). Phillip Dubois, best Painting of *Amaryllis* in Junior Division.

The Rose Garden Club was winner in the Invitational Class. Mrs. Melvin Sanders most Artistic Composition of Amaryllis in Show. Junior Trophy for most Blue Ribbons was won jointly by Miss Darby Hickson and Miss Janet McRae. Mrs. R. E. Chason most Blue Ribbons in the Single Bloom unnamed division. Wilmer R. Smith won for the most outstanding Hobby Collection of Amaryllis and also for the most Blue Ribbons in the Unnamed Cut Seedlings.

Mr. W. C. Strain awarded to Mrs. A. B. Palmer two trophies, one for the most Outstanding Horticultural Cut Specimen of American Hybrid Amaryllis in Show and the other for the most Blue Ribbons in the unnamed Potted Seedlings.

At the conclusion of the ceremonies President Dewey Hardy and Show Chairman Wilmer Smith expressed their appreciation to the membership and show entrants for their wonderful cooperation and assistance in putting on a very successful show. Co-Chairmen serving

with Mr. Smith were: Mr. J. C. McRae, Mr. Joe Brummitt, and Mr. S. A. Shannon.

At our May 1963 meeting officers were elected to serve for the 1963-1964 term and they are as follows: *President:* Mr. Wilmer R. Smith, Forest St., Chickasaw, Ala. Gl 6-7193; *Vice-Pres.:* Col. Robert Pollock, Brookley AFB, Mobile, Ala. He 8-6011; *Treas.:* Mrs. A. B. Palmer, 301 Hillside Drive, Chickasaw, Ala. Gl 6-7940; *Secty.:* Miss Mildred Laughlin, 701 Dauphin Is. Pkway, Mobile, Ala. 473-7448; *Historian:* Mrs. H. A. Allen, 210 Alpine, Chickasaw, Ala. Gl 6-8525.

We shall resume our regular monthly meetings in September on 4th Monday night, 7:30 P.M. at Garden Center, 1835 Dauphin St., Mobile. For our summer activities we shall have our annual picnic on July 13 at the Municipal Park.

AMARYLLIS JUDGES CERTIFICATES

Since the last report in the 1963 Amaryllis Year Book (page 35), the following named Amaryllis Judges Certificates have been issued by the American Amaryllis Society—

118. Mrs. Isabel Anderson, A Bar A Ranch, Medina, Texas (Horticulture only).
119. Mrs. E. M. Anderson, A Bar A Ranch, Medina, Texas (Horticulture only).
120. Mrs. Frank Hopwood, 620 Patterson Ave., San Antonio 9, Texas (Horticulture only).
121. Mrs. Bob E. Herold, 203 Cromwell Dr., San Antonio 28, Texas (Horticulture only).
122. Mrs. Paul A. Kane, 1001 McIlwaine St., San Antonio 1, Texas (Horticulture only).
123. Mrs. Larry H. Miller, 115 W. White Ave., San Antonio 14, Texas (Horticulture only).
124. Mrs. Sam C. Montgomery, 140 Harriet Dr., San Antonio 16, Texas (Horticulture only).
125. Mrs. Robert H. Parkinson, 1623 Hillcrest Dr. E., San Antonio 28, Texas (Horticulture).
126. Mrs. Edward T. Story, 307 Northhaven Dr., San Antonio 29, Texas (Horticulture only).
127. Mrs. John C. Watkins, 1910 W. Magnolia Ave., San Antonio 1, Texas (Horticulture only).
128. Mrs. C. R. Frampton, 803 Worthshire Rd., Houston 8, Texas.
129. Mrs. Clint R. Black, 1832 Forest Hill Dr., Houston, Texas 77023.
130. Mrs. Christine Hymers, 3403 Nottingham, Houston, Texas 77005.
131. Mrs. R. A. Wilder, 126 Whipple Dr., Bellaire, Texas.
132. Mrs. Sally Fox, 1527 Castle Court, Houston 6, Texas (Horticulture only).
133. Mrs. Charles H. Pease, P. O. Box 19265, Houston 24, Texas (Horticulture only).

AMARYLLIS EXHIBIT AT THE ATLANTA FLOWER SHOW, 1963

BECKWITH D. SMITH, *3479 Rockhaven Circle, N. E., Atlanta 24, Georgia*

The Atlanta Flower Show Association presented their Seventeenth Spring Flower Show at Lenox Square, Atlanta, Georgia, which was held on the Mall in two large tents for horticultural exhibits, and in the Auditorium of Lenox Square for flower arrangements. Two days, April 17-18, 1963. The Show was held in conjunction with the National Convention of Federated Garden Clubs of the United States.

Fig. 7. First showing in the United States of Buller Hybrid Amaryllis at the Atlanta Flower Show, 1963. Mr. Beckwith D. Smith is in the foreground.

Twenty-three pots of A. C. Buller, Cape Town, South Africa *Amaryllis* were exhibited in bloom during the two day show under the Educational Division, which bulbs had been held in cold storage since the fall of 1962 for this purpose. Many expressions were heard from garden club visitors that the *Amaryllis* display was the "focal point" of the show. *Amaryllis* for the show were brought into bloom by Beckwith D. Smith.

THE HOUSTON JUNIOR AMARYLLIS SOCIETY

The Houston Amaryllis Society sponsors a Junior Amaryllis Society.

The Houston Junior Amaryllis Society was organized August 23, 1963 (Friday), in the home of Mrs. W. W. Cone, president of the Houston Amaryllis Society.

Mrs. A. C. Pickard, founder of the Houston Amaryllis Society and now founder of the Houston Junior Amaryllis Society organized and

installed the first officers of this Society. Mrs. Pickard is a National Appointive Officer.

These officers will take office for two years:

President, David Koon
Vice-President, Dottie Pearle
Secretary, Debbie Stevenson
Treas., Robert Gunther
Cor. Sec., Bobby Pearle

There are seven members on Roll Call. This age group ranges from 8-14 years old. Three very interested mothers of the children attended

Fig. 8. Buller Hybrid Amaryllis in a group exhibited at the 1963 Atlanta Flower Show—colors: red, wine red, peach, salmon, rose, pink, bicolors, and white.

this meeting which showed interest in child development as gardeners. Mrs. E. E. Koon is Junior Club Chairman.

To be a Charter member one has the month of September to join. Closing date is September 30, 1963. The members of this group are from different areas in the city of Houston; this is not a neighborhood group of children.

Persons applying for membership should be gardeners or interested in becoming gardeners. This is considered a Horticultural Society Organization. Five meetings a year. The mothers suggested this due

to bringing the children. Meetings will be held in the evenings, 7 p. m.-8:30 p. m. This organization has no connection with school activities.

This organization is a member of the Texas State Garden Clubs, Inc. and National Council of Garden Clubs. The Junior Society will also include in their program all activities and procedures of a regular Junior Garden Club.

At the August meeting the Houston Junior Amaryllis Society met with the Houston Amaryllis Society and was formally introduced. On this date the children composed a constitution and by-laws, program, projects, etc., as would fit the group and their capabilities. The first Year Book will be ready for the September 30, 1963 meeting.

They will be included in the Spring Houston Amaryllis Society Official Show with a special place for their exhibits.

(CONTINUED from page 74.)

and with *Z. bifolia* have all failed. Pollen of *H. immaculatus* has not been available, nor has it been possible to cross back any of the seedlings on *H. immaculatus*. Even though we have the sterile form of *Z. bifolia*, this back cross was attempted and failed.

Many of the seedlings have set small offsets at the base of the bulb, but these have been strangely slow, even when removed from the mother bulb.

At this date we cannot report on the performance of this new hybrid under garden conditions. After the disaster of January, 1962 and the damage was discovered, all bulbs were potted as the original six had been, and kept in the greenhouse. We dislike the risk of planting them once more in the shade house (about two miles from our home), nor do we wish at present to trust them to the heavy soil in the garden, though we shall eventually do so.

Two attempts of a repeat cross failed in 1962, probably because improperly stored pollen was used, but we naturally wondered if our first cross was just a lucky one. This year, a heavy rain in late spring gave us a bonanza of flowers on *H. immaculatus* and *H. concolor*. This time we were prepared with lots of fresh pollen, for Morris has learned how to bring flowers on *Z. bifolia* almost at will, any time from late winter until fall. He keeps the pots very much on the dry side, then waters several days in a row, rather heavily.

The following successful crosses were made: *H. immaculatus* x *Z. bifolia*, *H. concolor* x *Z. bifolia and H. concolor* x *H. immaculatus*. Careful emasculation was carried out in all cases. From general signs and appearances of the growing seedlings, I would say that all three crosses are true hybrids. X. *Sydneya morrisii* was not just a lucky "take," after all.

2. LINEAGICS

[DESCRIPTION, CLASSIFICATION, EVOLUTION, AND PHYLOGENY OF LINEAGES]

A NEW PORCELAIN PINK LYCORIS

WILLIAM LANIER HUNT

For ten or fifteen years, I have been climbing up and down a 75 foot hill in the heat of July, August and September to make crosses in the lycoris beds in my wilderness arboretum. As other victims know, the

Fig. 9. A pink-flowered *Lycoris*, observed in the garden of William Lanier Hunt at Chapel Hill, North Carolina in 1963. This bulb as well as *L. radiata* were intermixed in a shipment of *L. elsiae*.

combination of 90 degree heat and a bad case of lycorisitis produces definite hallucinations. On certain days, I have been able to conjure up the image of a bright pink—instead of fire red—*Lycoris* seedling as big as *L. elsiae*. This vision has come to me for so many years, now, that when, on September 4th, 1962, I went down to the lycoris beds and saw right before my eyes the very thing about which I had been dreaming, I thought for a moment that heat had got me.

Fortunately for Southern gardeners, this *Lycoris* queen was no illusion. She stood on a 26-inch scape. Her five flowers measured over eight inches across! In a bed of *L. elsiae*, she stood out like a pink gem.

Individually flowers of this new lycoris are wider and the tepalsegs longer even than those of *L. elsiae*, making it a dramatic flower indeed. The color is a bright, slightly dusky pink: "Porcelain Rose", H.C.C. 620 down the middle of the tepalsegs, with a band of 620/1 on each side. *L. elsiae* is so delicate that it does not stand up to summer rains very well —especially in the hurricane season—but the new pink flower stood up well to an all-night downpour. Her color never faded until the last few days when it lightened slightly to a beautiful soft pink.

The appearance of this bright pink *Lycoris* in a shipment of *L. elsiae* and the occurrence of *L. radiata* in the same batch of bulbs (they bloomed at the same time, and, oh, how different they were!) seems to point to a possible *L. elsiae x L. radiata* cross. This was the very way I had contemplated creating this beauty. Has this wedding taken place in Japan whence these shipments come? Anyway, it might have taken at least five years to accomplish it from seeds.

Surely this experience and those of Mr. Caldwell, Mr. Morrison, Mr. Hayward, Mr. Houdyshel and others will make us all the more eager to import bulbs in quantity to see what we will get. Perhaps this large pink *Lycoris* has already appeared in someone else's collection. We hope so in order to get stock of it built up as fast as possible.

Foliage of the new flower was a little wider and a little bluer than that of *L. elsiae* and almost identical with that of the new creamy white described in PLANT LIFE, Vol. 17, No. 1, January, 1961 and poorly illustrated at pages 125-127; and again in this issue.

FURTHER NOTES ON A CREAMY WHITE LYCORIS

WILLIAM LANIER HUNT

In PLANT LIFE, Vol. 17, No. 1, Jan. 1961 at pp. 125-127, I wrote up a vigorous new creamy white *Lycoris* and published a poor illustration of it from a kodachrome. The plant which Mr. Caldwell describes in PLANT LIFE, Vol. 18, 1962 and illustrates at page 80 I believe to be the identical same plant.

In 1957, I sent a scape of this plant to Dr. Traub, and he made a botanical specimen of it and numbered the specimen #589 with the following description in his letter to me of Sept. 29th: "Tepaltube 18—18.5 mm. long (Reportedly as Dresden yellow)". I might add here that tepalsegs are 1 cm. wide.

My bulbs of this robust new *Lycoris* have increased both in pots and in the open. The foliage is of about the same degree of tenderness to cold as that of *L. elsiae*. Scapes are extremely robust. Frequently, they produce seven flowers to the scape, and the scapes are 19 inches and more tall.

Like Mr. Caldwell, I have tried pollen of everything I had in my garden or in the dessicator, in which I store and refrigerate pollen, on this new lycoris—all to no avail. This year, however, I do have seeds on the late fertile *L. radiata*. Will they be parthenocarpic?

Fig. 10. A creamy-white *Lycoris* as flowered in the garden of William Lanier Hunt, Chapel Hill, North Carolina, in 1963.

X CRINODONNA CL. 'DOCTOR STAFLEU'

HAMILTON P. TRAUB, *California*

In 1961 an outstanding clone of X *Crinodonna traubii* Moldk., bloomed for the first time. Such hybrids are the result of crossing *Brunsvigia* x *parkeri* Wm. Wats. ex Traub, and *Crinum moorei* and are notable in showing quite a range of variation. In contrast X *Crinodonna corsii* Ragion. ex Traub which result from crossing *Brunsvigia major* Traub (1963) and *Crinum moorei*, give relatively uniform progeny.

The outstanding X *Crinodonna traubii* Moldk., clone was again observed in the 1962 and 1963 flowering seasons and in each case came up to expectations. It was thus considered as a candidate for naming. It has been named in honor of the lineagicist, Dr. F. A. Stafleu of the University of Utrecht, Netherlands.

X **Crinodonna traubii** Moldk., cl. 'Doctor Stafleu' (Traub, 1964)

The vegetative characters are similar to those previously described by Traub (1961) for X *Crinodonna traubii* Moldk.

The umbel is many-flowered; the individual flowers are slightly declined, funnel-shaped, fairly wide open, somewhat star-shaped; the lower half of the tepaltube is yellowish-greenish, white above to half the length of the tepalsegs; the upper half of the tepalsegs delicately painted pink—between rhodamine pink (HCC-527/3) and Persian rose (HCC-527/3)—delightfully fragrant; pedicels at anthesis up to 2.6 cm. long; ovary oblong, flattish, 2 cm. long, 6x8 mm. in diam.; tepaltube curved, somewhat triangular, 3 cm. long, 5x6 mm. in diam. (base), 10 mm. diam. (apex); tepalsegs lanceolate, apex acute to bluntly acute; setsegs 9.2 cm. long, 3 cm. wide; petsegs 8.5 cm. long, 2.4 cm. wide; stamens 2/3 as long as the tepalsegs, upper 1/3 pinkish; style longer than the stamens, somewhat shorter than the tepalsegs, upper 1/3 pinkish, deeper toward stigma which is deep pink, capitate.

Holotype: Traub No. 955 (TRA), cult. La Jolla, Calif. 9-15-63.

LITERATURE CITED

Traub, Hamilton P. The Genus X Crinodonna, 1921-1960—Catalog of X Crinodonna Cultivars. Plant Life 17: 65—74. 1961.

Traub, Hamilton P. *Brunsvigia major* Traub. Plant Life 19: 59. 1963.

THE ENIGMA OF THE CULTIVATED CRINUM KIRKII

L. S. HANNIBAL, *Fair Oaks, California*

For some years the writer has grown *Crinum kirkii*, or what has long been called *C. kirkii* in the south, along with *C. sanderianum* which seems to be a smaller form of the above *C. kirkii*. At no time has the writer been able to obtain seeds or viable pollen from either plant. Similar experiences have been reported from Texas and Louisiana. Inquiry concerning *C. kirkii* discloses that it is common to the Rift

Valley in Kenya and grows well above 7000 ft. there. Also, that the plant rarely produces offsets and is best established by seed. This statement by Lady Jex-Blake is somewhat in contrast to our experience as the local form produces frequent offsets.

Fig. 11. *Crinum kirkii* as grown by William Morris in Australia. It is typical of high elevation species and grows best when nights are cool.

The matter recently came to a head when William Morris submitted several bulbs found in a garden near Sydney, Australia, which were presumably *C. kirkii*, but had much larger bulbs and broader, less erect foliage. On checking with Baker's original description and colour plate (Bot. Mag. pl. 6512) of *C. Kirkii* we find that this Australian bulb and its foliage to be in close agreement. The bulb is globose and the foliage which is 10 to 15 cm. broad spreads in a semi rosette

from a very short neck. The adult leaves are relatively limp and droop upon the ground. They are not channeled.

In the light of this evidence it is possible that the so called *C. kirkii* in the United States are hybrids, and from the long slender channeled leaves we could suspect that *C. bulbispermum* is involved in the cross. Further investigation is necessary to confirm this, but in the verification of species there is no better proof than obtaining actual material from the wild. In this instance this should be done.

CRINUM FLACCIDUM AND A YELLOW FORM

A. R. R. Higginson * *and* L. S. Hannibal

We have now grown and flowered several forms of *Crinum flaccidum* Herbert in the open for a sufficient length of time to be fairly familiar with most of the plant's distinct habits or features, several of which are well worth noting. The Darling River forms of north central New South Wales are probably better adapted to our Gulf states where summer rains occur, whereas the South Australian strains are ideally adapted to California's arid summer enviroment since the two climates are near identical. The superficial environment under glass or in Florida for a desert plant which normally experiences six inches of rain or less can cause a number of erroneous conclusions regarding these near unknown desert types. This is particularly true in reference to flowering, the Darling River and central desert forms flowers in late summer after the summer storms, but the South Australian form flowers in late autumn just preceding the winter rains. Most desert plants usually find it necessary to economize on foliage and we often find chlorophyll in petals and other floral parts. In *C. flaccidum* the flower buds are a vivid chlorophyll green until an hour or two before opening, then this green suddenly turns to a chartreuse, then amber, and finally to a white as the tepalsegs open up. In a greenhouse or on a warm evening the flowers usually open into a trumpet shape showing a curved tepaltube with declinate filaments, but when the temperature makes a decided drop of fifteen or twenty degrees as occurs in a desert at sundown the tepaltube becomes quite rigid and the tepalsegs assume on open patent position with spreading anthers.

Several other features are to be noted; in lieu of producing small offsets as occur with most Crinums, *C. flaccidum* splits rather suddenly into two plants in a manner similar to *C. asiaticum* or *C. pedunculatum*. Both the spreading of the anthers and splitting of the bulb are in my observation subgenus *Platyaster* features, however, a number of *C. flaccidum* forms have rather broad elliptical tepalsegs which appear contrary to the linear pattern prescribed for *Platyaster*. It is rather apparent that the identification key is in need of rectification.

The attractive yellow flowered form which comes from the rocky Pichi-Richi pass near Port Augusta in South Australia shows sufficient

* Deceased.

variation to be considered as a form. The color of the blossoms is rather an obvious feature. It is associated with the decomposition of the chlorophyll and may possibly occur due to the plant's adaptation to an alkaline soil of pH 8 or 9. The color is intermediate between a chartreuse green and dresden yellow (RHS 663/3 or /2 and 64/3 or /2). The color varies some from plant to plant, according to the age of the flowers, and according to the air temperatures. The deeper colors occur in cool weather. Secondly, the blossoms of the yellow form are about 60% the size of the type, have quite a pronounced elliptical tepalseg pattern, are prone to be quite patent with widely spreading anthers, and are inclined to develop quite a curvature to the tepaltube during the heat of the day. But the most distinctive of all features is the phototropic behavior of the scape and umbel which tends to face all of the blossoms into the sun and turn as does a sunflower. This particular behavior is not present in the other forms which tend to distribute the individual blossoms radially in the umbel and do not track the sun.

Other distinctions are that the filaments are yellow whereas those of the type are white, the style is amber whereas the type is purple in the upper portions, and only one or two blossoms open daily whereas the type opens two or three in a radial pattern. On the basis of the bulb and foliage there are no apparent distinctions, but the scape of the yellow form carries some rust-red pigmentation near the groundline whereas the other forms indicate only a slight trace of pigmentation. In most cases with other species the scape or bulb pigmentation is associated with plants having red or pink blossoms. However, there seem to be exceptions.

The Quirindi group of the Darling River *C. flaccidum*, which is the most easterly group thus far reported, is unique as far as variability of color and tepalseg shape are concerned. The colors range from white through pink to a wine red. This pigmentation is on the exterior of the tepalsegs. Tepalsegs may range from long slender ray-like to elliptical forms which are half as broad as they are long. We know of no other species with which this group of bulbs could have crossed naturally but if such a cross did take place in rather recent geological times then not enough time has elapsed for the genetic upset to become stabilized by natural selection. The diversity is rather fascinating. It is unfortunate that the imported plants do not tend to flower easily so we do not know if the group are entitled to the rank of form or not, but the plants do bear watching as the colored blossoms reportedly resemble magnolias.

FURTHER NOTES ON AMERICAN CRINUMS

MRS. CARL SHIRLEY, *1540 Forsythe Street, Beaumont, Texas*

The notes will be arranged by collection dates. It appears that three different forms grow together since we have found them blooming at different times in the same places. There seems to be a slowing

Fig. 12. Native American Crinums observed on the banks of the Neches River, Beaumont, Texas. Upper left, weak grower, apparently *Crinum americanum*, photo July 5, 1963; upper right, robust grower, apparently *Crinum strictum*, photo Sept. 14, 1963; lower left and right, robust growers, apparently *Crinum strictum* var. *traubii*, photo Nov. 11, 1962. All photos by Mrs. Carl Shirley.

The Cypress (*Taxodium distichum*) "knees" in lower left, protruding from the ground, function in conducting air to the roots of the tree.

up between the blooming of each of the forms and this may account for their apparently not intermixing.

We have had an exceptionally dry summer in 1963 except for the 20-inches of water in our yard during the downpours caused by hurricane "Cindy" in September. They have not bloomed well. I plan to pot some and keep the moisture up and note if this will help. I am hoping to have blooms on the "pink" ones this year, and we are looking forward to our trip in November to see if we are able to find more of these plants.

July 5, 1963.—Collections were made in Jefferson County, about 2 miles south of State Highway 90 bridge across the Neches River, in a little bayou. These are some of the very small-type (see Fig. 12). Evidently they bloom at different times here too.

July 27, 1963.—There were not many blooms in evidence on this trip. It appears that *Crinum americanum* finishes its blooming season around the end of July. We originally believed that their blooming season began in July, but have since found some in bloom in mid-June. Thus the flowering season may start earlier.

August 17, 1963.—We found very, very few blooms on this trip. Seeds were mature from earlier blooms, and we collected some. They were large seed-pods with the antenna-like projection on top.

September 14, 1963.—We collected a few bulbs in bloom on this trip (see Fig. 12). These apparently are *Crinum strictum.*

October 26, 1963.—We collected some bulbs in bloom, but they were few and far between. We collected many seeds that apparently are *Crinum strictum* that bloomed in September.

November 11, 1962.—We found many blooms. This was the first time we were able to reach these. The water was at a very low level at that time of year, and had not been before, and has not since, in our memory, been that low. We were able to get some close-ups (see Fig. 12). Some of these were of the "pink-hued" kind. These very late flowering plants apparently are *Crinum strictum* var. *traubii* Moldk.

All of these different kinds—*Crinum americanum*, *C. strictum*, and *C. strictum* var. *traubii*—appear to grow together and bloom at different times. There is apparently a slowing-up of bloom between the flowering periods and this accounts for little if any interbreeding.

DECREASE IN SIZE OF HERBARIUM SPECIMENS DUE TO DRYING

HAMILTON P. TRAUB

In connection with the drying of *Hymenocallis kimballiae* leaf specimens on January 20, 1962, preliminary data on the decrease in width and length of leaf measurements were obtained. Duplicate leaf specimens of *Hymenocallis kimballiae* were dried between blotters separated by corrugated aluminum separators in the plant press with heat supplied from an air circulation furnace outlet. The measurements before and after drying are shown in Table 1.

Table 1. Decrease in size of herbarium specimens (leaves) of **Hymenocallis kimballiae** Small ex Traub due to drying.

	At start cm.	After drying cm.	Extent of decrease cm.	Percent of decrease
Width	8.6	7.7*	1.1	12.3
	10.4	9.1*	1.3	12.6
Length	82.5	79.2	3.3	3.0
	82.0	80.9	1.1	1.3

* It should be indicated that the extent of shrinkage at cross-sections was less than indicated.

The important conclusion from Table 1 is that the loss for percentage width is relatively much greater than for percentage length.

These results are to be considered as a preliminary sampling, and should be followed up with a larger number of measurements under specified drying conditions so that there could be available data that might be useful as the basis of allowances to be made when describing dried specimens.

HOW I PREPARE PLANT SPECIMENS FOR IDENTIFICATION

Alek Korsakoff, *2975 Shipping Ave., Miami, Florida, 33133*

In preparing plant specimens to be sent in for identification, I prefer to use paper toweling (2 attached sheets). At the beginning I tried the plants with the flowers unopened, but found that it was difficult to make the identification on that basis. Therefore, I am now opening the amaryllid flower to show the relationship of the parts—tepaltube, tepals, stamens and pistil—so that the person who is to make the identification may have a better chance to make it. So, I cut the tepaltube, if there is any, on through the ovary and part of the pedicel—about half way. The flower is then spread out with the inside showing which exposes all of the parts for ready observation. If a second flower is available, one of these is placed so as to show the way it actually appears in bloom.

To hold the plant and flower in place, I use tiny strips of masking tape or similar tape, for holding down the unruly parts. I believe that it is best to tape every part which is mounted—roots, leaves, scape, and flower parts, before pressing.

If there is no facility for quick drying, the following procedure is followed: The specimen on the towel paper is covered with another layer of towel paper, a few layers of newspaper are placed below and above mounted specimen to be dried, and the whole is placed under a stack of heavy books. This works well for *Zephyranthes* and similar small amaryllids.

If the specimen is a large *Amaryllis* for instance, then the large parts such as the scape and the ovary, are split lengthwise and one half is discarded. This will aid in drying.

When sending in the specimen, if the plant is not too large and thick, it is even possible to fold the towel paper with mounted specimen

for insertion into an envelope, but better results are obtained by using two thicknesses of cardboard without folding.

REGISTRATION OF NEW AMARYLLID CLONES

Mr. W. D. Morton, Jr., Registrar,
Mr. Edward Authement, and Mrs. Emma D. Menninger,
Assistant Registrars

This department has been included since 1934 to provide a place for the registration of names of cultivated *Amaryllis* and other amaryllids on an International basis. The procedure is in harmony with the INTERNATIONAL CODE OF BOTANICAL NOMENCLATURE (edition publ. 1961) and the INTERNATIONAL CODE OF NOMENCLATURE FOR CULTIVATED PLANTS (edition publ. 1958). Catalogs of registered names, as well as unregistered validly published names, will be published from time to time as the need arises. The first one, "DESCRIPTIVE CATALOG OF HEMOROCALLIS CLONES, 1893-1948" by Norton, Stuntz and Ballard was published in 1949. This may be obtained at $2.50 prepaid from: Dr. Thos. W. Whitaker, Executive Secy., THE AMERICAN PLANT LIFE SOCIETY, Box 150, La Jolla, Calif. CATALOG OF HYBRID NERINE CLONES, 1882-1958, by Emma D. Menninger; and CATALOG OF BRUNSVIGIA CULTIVARIS, 1837-1959, by Hamilton P. Traub and L. S. Hannibal, were published in 1960 Plant Life, with additions to both in Plant Life 1961. In Plant Life 1961, the first edition of THE GENUS X CRINODONNA was published which serves also as a catalog of cultivars. A catalog of Amaryllis names and also catalogs of the names of other cultivated amaryllids, are scheduled for publication in future issues.

Only registered named clones of Amaryllis and other amaryllids are eligible for awards and honors of the AMERICAN AMARYLLIS SOCIETY at Official Amaryllis Shows.

Correspondence regarding registration of all amaryllids such as *Amaryllis, Lycoris, Brunsvigia, Clivia, Crinum, Hymenocallis*, and so on should be addressed to Mr. W. D. Morton, Jr., Registrar, 3114 State Street Drive, New Orleans 25, Louisiana. The registration fee is $2.00 for each clone to be registered. Make checks payable to AMERICAN PLANT LIFE SOCIETY.

THE TERM "STRAIN" DROPPED

In "The International Code of Nomenclature for Cultivated Plants," edition 1961, adopted by The International Commission for the Nomenclature of Cultivated Plants, Article 12, it is stated that the "practice of designating an improved selection of a cultivar (variety) as a strain or equivalent term is not adopted in this Code." In harmony with this provision, the American Amaryllis Society, affiliated with The American Plant Life Society, will discontinue using this term in all official publications.

Under Article 12, it is indicated that any such selection showing sufficient difference from the parent cultivar (variety) to render it

worthy of a name is to be regarded as a distinct cultivar (variety). Thus, *Amaryllis* clones when named should be referred to the proper Division, and should no longer be indicated as belonging to the "Mead Strain," or any other "strain." The breeder's name should be indicated in the registration procedure.

Cultivated *Amaryllis* hybrids are divided into eight main Divisions, and one Division to take care of any that do not fall within any of the seven, as explained in Traub—The *Amaryllis Manual*. 1958.—

Cultivated wild Amaryllis, or Division 1 (D-1)
Amaryllis 'Elegans Hybrids,' or Division 2 (D-2)
Amaryllis 'Belladonna Hybrids,' or Division 3 (D-3)
Amaryllis 'Reginae Hybrids' or Division 4 (D-4); subdivision D-4A and D-4B
Amaryllis 'Leopoldii Hybrids,' or Division 5 (D-5); subdivisions D-5A and D-5B
Amaryllis 'Orchid-Flowering Hybrids,' or Division 6 (D-6)
Amaryllis 'Double Hybrids,' or Division 7 (D-7)
Amaryllis 'Miniature Hybrids,' or Division 8 (D-8)
Amaryllis 'Unclassified Hybrids,' or Division 9 (D-9).

ZEPHYRANTHES X RUTHIAE CLONE 'ELLEN KORSAKOFF'

HAMILTON P. TRAUB, *California*

Under date of July 23, 1963, Mr. Alek Korsakoff, 2975 Shipping Ave., Miami, Florida, sent a dried specimen of a *Zephyranthes* hybrid he had duplicated. A similar cross had been made by Dr. Howard of San Antonio, Texas: *Z. rosea* x *Z. citrina*, and it was named *Zephyranthes* x *ruthiae*. Mr. Korsakoff repeated the cross Oct. 1, 1960, and first blooms were obtained June 21, 1962; only one seedling survived. However, this is a particularly beautiful hybrid and the clone has been named for the late wife of Mr. Korsakoff:

Zephyranthes x *ruthiae* cl., *'Ellen Korsakoff'*

Bulb globose up to 1 inch in diam., brown to black, with neck about ½ inch in diam.; offsets produced freely; prefers full sun; leaves 10—13" long, about ¼ inch wide, shape and color of *Zephyranthes rosea;* flowers buttercup yellow, (HCC-5/2), shaded on edges and tips with mandarin red (HCC-17/2) with center of Cyprus green (HCC-59); open to 2⅞ inches wide; tepaltube about ¼ inch long; tepalsegs 1¾ inches long, setsegs, ½ inch wide; petsegs ⅝ inch wide; pedicel about 2 inches long; peduncle 9 inches long, round.

Holotype: No. 954 (TRA), cult. Alek Korsakoff, Miami, Florida, 7-23-63.

GROWING WORSLEYA RAYNERI FROM SEEDS

(In 1962, Mr. Robert D. Goedert, of Jacksonville, Florida, paid a collector to gather seeds of *Worsleya rayneri* from a mountain top in Brasil. These seeds were made available to his customers. It will be most interesting and helpful to record the successes and failures of those who experimented with these rare and valuable seeds. Two reports are included in the present issue. It is hoped that others will send in reports of their experiments for publication here without any special request from the editor.—*Editor*).

1. REPORT FROM SAN DIEGO, CALIF., by Burr Clouette

The seeds of *Worsleya rayneri* was very difficult for me to germinate. I had to obtain two batches of seeds, about 60 in all, to obtain only two plants, after losses suffered. Only one of these is thriving, and the other has lost its roots and leaves although the bulb seems to be sound.

I tried three different ways for the germination of the seeds: (a) planted in Black Magic planter mix—some germination, but all seedlings damped off; (b) floating seeds on mineral water (the kind for human consumption)—no germination; and (c) planted in vermiculite—about a fourth of the seeds germinated, 5 seedlings in all—only two seedlings have survived.

The sound seedling mentioned above is doing well and seems to be able to make a go of it. It is now almost a year old. The neck is a couple of inches long, and about as big around as a lead pencil. The bulb is about a half inch in diameter (see Fig. 22).

This seedling is planted in a square 2-inch plastic pot in Black Magic planter mix. I fertilize it and all of my other *Amaryllis* every two weeks with a half strength liquid fertilizer. Occasionally instead of a complete fertilizer, I use one of the so-called acid fertilizers which is low in nitrogen and high in phosphorus.

2. REPORT FROM LA JOLLA, CALIF., by Hamilton P. Traub

In 1940-1942, the writer obtained a few seeds of *Worsleya rayneri* from Rex Pearce Seed Company. These were germinated at Beltsville, Maryland. The writer noticed what appeared to be mycorrhiza on the roots of the seedlings, but before he could finish the research into this the war intervened. When he returned to Beltsville, Maryland, in 1945, the seedlings had died from neglect.

In 1962, he received seeds of *Worsleya rayneri* from Mr. Robert D. Goedert of Jacksonville, Florida. These were floated on tap water and every seed germinated. Mr. Clouette who tried mineral water had no success and this may be due to the mineral water that he used.

The seedlings are being grown in two potting mixtures: (a) equal parts of garden loam and granulated peat; and (b) Black Magic planter mix, and also a similar mix made by the writer. They are growing very slowly in both mixtures, but seem to be a little larger in the second. The seedlings are not higher than 2 to 2½ inches. Lately a slowly available fertilizer has been used and this appears to be effective. In

the second report, the writer hopes to record better success with this most difficult species.

CHROMOSOMES OF HEMEROCALLIS 'GEORGE GILMER'

WALTER S. FLORY, *Wake Forest College, Winston-Salem, North Carolina*

In the 1959 PLANT LIFE (15:28-29) Dr. H. P. Traub described a new yellow-flowered daylily under the title "The 'George Gilmer' Diploid Daylily."

Since that time the vigor of this clone—coupled with its lush growth, profusion of flowers, and other meritorious characteristics—has led to the suspicion that 'George Gilmer' might actually be a polyploid, perhaps a tetraploid, type. In the spring of 1963 Dr. Traub had a division of this variety sent to us and at his request we have examined the chromosomes of this plant.

Fig. 13. Somatic chromosomes from a root-tip of *Hemerocallis* clone 'George Gilmer'. 2n = 22. X 1500.

The 'George Gilmer' variety has 22 chromosomes and hence is a diploid as suggested in its original description. Thus while the variety does possess certain characters most usually found in tetraploid daylilies, these must here be attributed to either, or both, the type or the arrangement of genes present.

The accompanying figure (Fig. 13) depicts the somatic chromosomes at metaphase, as drawn by camera-lucida from a rather typical root-tip nuclear division. This root-tip had been treated for 4 hours in a 0.2% colchicine solution, fixed in acetic-alcohol (3:1) overnight and squashed

in 1% acetic-orcein. The chromosome pretreatment was sufficient to permit the two chromatids of each individual chromosome to separate slightly. The chromosomes range in length from about 3.3 to 6.7 microns, with the majority being from 4 to 5 microns long and having subterminal centromeres. At least one of the longest, and one of the shortest, chromosome pairs have median, or near median, centromeres.

AMARYLLID NOTES, 1964

HAMILTON P. TRAUB

Hymenocallis lobata Klotzsch, in Otto & Dietr., Allg. Gartenz. 11: 124. 1843, *nomen nudum*. This is indicated as a new species introduced by Ed. Otto from Caracas, Venezuela, which had not flowered in culture up to 1843. Thus, it was never described.

Nothoscordum inodorum (Ait.) Nichols (syn.—*N. fragrans* (Vent.) Kunth) has recently been collected for Robert D. Goedert, of Jacksonville, Fla., by his collector in Santa Caterina, Brasil. Local name "Acucena"; flowering range, March-January; alt. 63 m.; average range 20°—35° C. Growing in half shade, near the river.

This plant has proved to be a weed in California, but apparently is not so noxious in the humid East and Southeast. The flowers are small, whitish tinged light pinkish; delightfully fragrant.

"Gardinia Bertero", **nom. nudum**

"G. purpurascens Bertero", **nom. subnudum**

In 1929, Bertero published a "List of plants observed in Chile" in "Mercurio Chileno", nos. 12, 13 & 14, Mar., Apr., and May, 1829. In this there appeared a brief reference to "Gardinia purpurascens Bertero", "A bulbous plant resembling the *Allium* and the *Ornithogalum*, L., which I have seen only once in the inclosures along the road leading to Quinta, not far from the houses of Zamorano. It is called "mapolita azul", and merits cultivation in gardens on account of the elegant color of its flowers".

An article based on the above was published as "Liste des plantes observées au Chili, dans l'année 1828, par le Dr. Bertero (Mercurio Chileno, no. 12, 13 et 14, mars avril et mai 1829)" in "Bulletin des sciences naturelles et de géologié, rédigé par MM. Delafosse, Guillemin, et Kuhn. 2nd Section du Bulletin Universel, publié sous les auspices de Monseigneur le Dauphin, par la Société pour la propagation des connaissances scientifiques et industrielles, et sous la direction de M. le Baron de Férussac". v. 20. pp. 105—112. 1930. On page 112, there is a reference to 'Gardinia purpurascens, Bertero. Cette plante est le type d'un nouveau genre, que l'auteur place entre L'Allium et L'Ornithogalum".

This article was also translated into English by W. S. W. Ruschenberger, M. D., U. S. Navy, and sent to the editor of "The American Journal of Sciences and Arts", and was published in that publication in vol. 19: 63—70; vol. 20: 248-260; vol. 23: 78—96, 250—271. 1931—33. On page 81, appears the brief reference to "Gardinia purpurascens Bertero".

Although the generic name "Gardinia Bertero" was never published, it is listed in Index Kewensis, along with the species name, "Gardinia purpurascens Bertero". In Steud., Nom. ed. II. i. 667, it is listed as "Gardinia violacea Bert. ex Steud."

It is thus clear that the generic name "Gardinia Bertero" was never published and is thus a *nomen nudum*. "Gardinia purpurascens Bertero" is not validly published since it is not possible to identify it from the general reference. The new name for it by Steudel, without a description is also a *nomen subnudum*.

THE NAMING OF CRINUM GIGANTEUM

The amateur grower is usually confused about the application of the epithet 'giganteum' as applied to a certain average-sized *Crinum*. He believes that such a name has to refer to a 'very large' plant. However, according to the Code, no matter how inapt the name first given to a plant, it has to be used forever thereafter. Thus, the confusion about the name, *Crinum giganteum* which represents an average-sized plant. When confronted with a very large to them unknown *Crinum* species, some readers assumed that it was *Crinum giganteum* and wasted much time and effort trying to prove it. To settle this matter, the following quotation from Richard Anthony Salisbury (1761-1829)—The Genera of Plants; a fragment containing the Part of Liriogamae. 1866—is reproduced:

". . . *Crinum giganteum* of Botanist's Repository was ridiculously so called, owing to the blunder of a Scotch Gardener, as it is by no means a very large plant; but a little before it was first figured by Thompson in 1798, I had proposed the name of *Gigas* for a true *Crinum* in the *Marchioness* of Rockingham's collection, just sent to her from Port Jackson, the *Pedunculatum* of Mr. R. Brown, which is really gigantic in size; and this Scotch gardener happening to be present in the stove at its christening, when he returned to Lee and Kennedy's, mistook one of the Sierra Leone plants given to them by the Marchioness, for a young sucker of that from Port Jackson, and told them it was so called, transforming by his Northern pronunciation *Gigas* into *Jagus*, in which latter way the name is printed in the work above mentioned; afterwards when the figure of the Botanist's Repository came out, Mr. Kennedy changed *Jagus* to *giganteum*. . . ."

Since 'jagus' is really a misspelling of 'gigas' and can be corrected according to the Code, the corrected first name of *Crinum giganteum* Andr. Bot. Rep. pl. 169. (1798) is really *Amaryllis gigas* Thompson. Bot. Displ. pl. 6. 1798, err. *Jagus*. But *Crinum gigas* Nakai (1930),

the giant *Crinum* on the Island of Iwo Jima, is a different plant—a form either of *Crinum asiaticum* or *C. pedunculatum*. Thus, *Crinum giganteum* Andr. (1789) has to stand, and *Crinum gigas* (Thompson) Dandy, in Jour. Bot. Lond. lxxvii. 64. 1939, err. *Jagus*, is a synonym.

COLOR FORMS OF CRINUM GOUWSII

In the 1950's, the writer obtained seeds of *Crinum gouwsii* Traub by crossing siblings because no seeds could be set by self-pollination. These seeds were distributed as widely as possible. A few were sprouted here. Three were set in a location where they would not be over-watered, and one seedling had been blooming since 1960. However, no seeds could be set by self-pollination. In June 1962, two seedlings bloomed at the same time, and it was possible to set seeds by crossing the two siblings. It was noted that the flowers of one of the seedlings were streaked a deeper purplish in contrast to the color noted in the original description (see Plant Life 38: 38—41, plate 8. 1954). Thus the seeds distributed should carry the genes for this deeper colored form and it should be possible to establish it as a true breeding form by inbreeding. This is a challenge to those who received seeds from this season's crop.

FRUITS AND SEEDS OF **CRINUM BULBISPERMUM**

The various varieties of *Crinum bulbispermum* differ in the capacity to produce seeds. The variety *roseum* does not flower as freely as variety *album* and thus the latter produces many more seeds.

Table 1. The fruits and seeds of **Crinum bulbispermum** var. **album**, from open pollination, 1962.

Fruits shape	length cm.	diam. cm.	Number of seeds *
round	2.5	2.5	1
triangular, rounded edges	3.3	5.1	3
	3.5	3.5	5
irregular (lumpy)	4.8	5.2	8
	4.4	6.5	9
globular	6.5	7.0	42

* Seeds are round or roundish if solitary in the fruit; irregular, angled from pressure when several are in the fruit. Length and diameter of seeds:—

length cm.	diam.	length cm.	diam.
1.5	1.1	2.3	3.0
2.3	2.2	3.1	3.5
2.5	2.0	2.4	3.7
2.5	2.8		

The variety *album* has a yellowish-green tepaltube, and the white tepalsegs are banded inside and outside with yellowish-green. The fruits are yellowish-green, stained amber where exposed to the sun. The fruits of variety *roseum* are light green, stained brownish-reddish where exposed to the sun.

The variety *album* produces so many seeds by *open pollination* that it is a real task to transport them to the trash can. If left on the ground, hundreds of seedlings will soon spring up. In June 1962, the writer again noted some of the huge globular fruits up to 7 cm. in diameter along with the smaller fruits. The data is summarized in Table 1.

ANTHER COLOR AS DIAGNOSTIC FACTOR IN BRUNSVIGIA HYBRIDS

When deanthering large numbers of the flowers of *Brunsvigia* major, and various *Brunsvigia* x *parkeri* clones in a breeding project, it was noted that the anther color differed markedly before dehisence: *B. major* (dull whitish anthers); B. x parkeri, (English group) received as "*B.* x *kewensis*" (light lavender anthers); *B.* x *parkeri* (Zwanenburg group) clone 'Johannesburg' (faintly lavender anthers); *B.* x parkeri (Australian group) clone 'Hathor' (white anthers); and *B.* x parkeri (American group) Hannibal clone (anthers reddish).

It is thus important to compare anther color in the hybrids with that of the reported parents—*Brunsvigia rosea*, *B. josephinae*, *B. orientalis*, *B. grandiflora* and other *Brunsvigia* species. Thus something could be learned about the parentage of the hybrids since the various characters tend to segregate in the progeny after the first generation.

Lycoris x jacksoniana Traub, **hybr. nov.**

Plantae hybridae reciprocae inter L. sprengeri et L. radiatam; foliis L. radiata fusco-viridioribus; scapo usque ad 55 cm. alto; spatha anguste lanceolata 3.5- 4 cm. longa; umbella 5—6-8-flora; floribus L. radiata minus subpurpureo-rubellis usque ad magis subpurpureo-rubris; pedicellis 1.7—4 cm. longis; ovario 5 mm. longo; tubo tepalorum 8—10 mm. longo; segmentis tepalorum 4.7—4.8 cm. longis 0.9—1.3 cm. latis.

Originated by Sam Caldwell of Nashville, Tenn.

Holotype: No. 960 (TRA), collected by Sam Caldwell, Aug. 16, 1963. Paratypes: Nos. 958, 959 (TRA).

(CONTINUED from page 5.)

THE FLOWER ARRANGEMENT CALENDAR, 1964, by Helen Van Pelt Wilson. M. Barrows Co., 425 Park Av., So., New York 16, N. Y. 1963. $1.50. The publishers sponsor an annual flower arrangement calendar contest. In this little book, some of the outstanding photographs of floral arrangements accepted by the publishers are reproduced in calendar form for 1964. This calendar will appeal to those interested in flower arranging.

JUNIOR FLOWER SHOWS, by Katherine N. Cutler. M. Barrows & Co., 425 Park Av., So., New York 16, N. Y. Pp. 145. Illus. $3.50. This is a guide calculated to help stage flower shows in which children from the elementary grades on through high school may participate. It will appeal to parents, teachers, garden-club members, and scout leaders, and also to the children themselves.

THE NEW COMPLETE BOOK OF AFRICAN VIOLETS, by Helen Van Pelt Wilson. M. Barrows & Co., 425 Park Av., So., New York 16, N. Y. Pp. 290. Illus. $5.95. This is a revised and enlarged edition of the author's earlier book on the same subject, incorporating new material on genetics, club programs, selling, photographing, and a chapter on other gesneriads. Profusely illustrated.

THE MICROBIAL WORLD, by R. Y. Stanier, M. Doudoroff, and E. A. Adelberg. 2d ed., Prentice-Hall, Englewood Cliffs, N. J. 1963. Pp. 753. Illus. This revised, up-dated edition of this highly valued standard text on microbiology will be welcomed by students and teachers. A new feature of this edition is the introduction of biological principles at appropriate points in the text which allows for a more coherent and unified development of fundamental topics such as cell structure, metabolism and nutrition. The introductory portion is followed by a survey of the principal microbial groups; an exposition of microbial nutrition, metabolism and physiology; an account of bacterial cytology, genetics and classification; and discussions of the role of microorganisms in the cycles of matter, their mutualistic and parasitic relationship with other forms of life, and their utilization by man; recent discoveries about the fundamental structure of cells, and the nature of viruses; and recent developments in molecular genetics. This is required reading for all who are interested in microorganisms; and this outstanding text is highly recommended.

BIOCHEMICAL SYSTEMATICS, by R. E. Alston and B. L. Turner. Prentice-Hall, Englewood Cliffs, N. J. 1963. Pp. 404. Illus. This outstanding new text will be welcomed especially by all who are interested in biosystematics. The authors have brought together for the first time a summary of the biochemical data which has bearing on the grouping of organisms into lineages, and they are to be congratulated on an excellent job. Following the introduction, there are chapters on taxonomic principles; plant taxonomy; introduction to biochemical systematics; serology and systematics; amino acids; fatty acids; carbohydrates; alkaloids; cyanogenetic substances; phenolic substances; quinones; terpenoids; misc. compounds; biochemical studies of hybrids; and general evaluation. This original contribution is required reading for biochemists and biosystematists. Highly recommended.

ADVANCES IN AGRONOMY, Vol. 15, edited by A. G. Norman. Academic Press, 111 5th Av., New York 3, N. Y. 1963. Pp. 415. Illus. $13.50. This 15th volume in the series includes contributions from fourteen outstanding authorities. The topics covered are competition among crop and pasture plants; chemistry of the micronutrient elements in soil; impact of chemical weed control on farm management practices; the physics of wind erosion and its control; plant nutrient losses from soils by water erosion; creeping alfalfas; and silica in soils. Highly recommended.

MICROBIAL CLASSIFICATION, edited by G. C. Ainsworth and P. H. A. Sneath. Cambridge Univ. Press, 32 E. 57th St., New York 22, N. Y. 1962. Pp. 483. Illus. $9.50. The papers included in this book were delivered at the 1962 London microbiological symposium in which twenty-three authorites participated. The papers are concerned with current approaches to the classification of microorganisms—protozoa, algae, fungi, bacteria and viruses. Morphological biochemical and genetical approaches are evaluated against a theoretical background; and the procedures in classification, nomenclature and identification are discussed. This stimulating book should serve as an introductory text in the field of microbial classification, and is highly recommended.

THE ARCHITECTURE OF MATTER, by Stephen Toulmin and June Goodfield. Harper & Row, 49 E. 33rd St., New York 16, N. Y. 1962. Pp. 399. Illus. $7.50. This outstanding new book on the philosophy of science will be welcomed by all scientists. In Part 1, the authors trace problems concerned with matter from ancient to early modern times. In Part 2, the activities of the inanimate are explored beginning with Boyle and Newton, and on through to quantum theory. In Part 3, the structure of living things is examined. In an epilogue, the possibilities of a reunified view of matter and life is considered. Apparently the chemical elements, as such, are neither inorganic or organic but they may potentially function in either the one or the other role. This stimulating book is required reading for all scientists.

(CONTINUED on page 116.)

Fig. [illegible] **Lycoris** species and hybrids between them. Extreme left, **L. sprengeri**, and extreme right, **L. radiata**; flowering [illegible] hybrid seedlings between these two parents are grouped in the center. The new hybrid has been named **Lycoris × jacksoniana**, in honor of President Andrew Jackson, whose home, The Hermitage, is near Nashville, Tennessee. Photo by Sam [illegible].

3. GENETICS AND BREEDING

LYCORIS REPORT—1963

SAM CALDWELL, *Tennessee*

The good old summertime in middle Tennessee, where I live, is not always good from the gardener's viewpoint. It can be beautiful when the rains come occasionally, but too many summers are hot and dry, and gardens and gardeners languish.

No matter what the weather, one of the things that thrill me on a July day is to be walking along a flower border and discover greenish white spearheads pushing up out of bare ground. Nearby will be a label reading "lycoris sanguinea," and while it is not one of my favorites, it lets me know that the Lycoris season is getting under way and that exciting things will be happening on through August, September and into October.

Aside from the fact that many lycorises are such beautiful flowers that anyone would covet them, it is certainly true that part of their appeal lies in being so "different"—with strange growth habits—and in the fact that we still have much to learn about them. There are problems of identification and nomenclature along with problems of culture; and there are wonderful opportunities for gardeners with a creative bent who may wish to cross-breed them.

Authors of garden encyclopedias and bulb books have not done a very good job of covering the genus *Lycoris*, and it is mainly through the experiences of bulb fanciers, reported in publications like this one, that we shall gradually accumulate a reasonably full store of factual information about these bulbs. Progress is slow, because lycorises just don't do things in a hurry. But each year we are able to tie up a few loose ends—to verify an identification, perhaps, to approximate a hardiness rating, to determine what conditions promote bloom in a particular species. In keeping with these thoughts the following report is offered.

SPRENGERI-RADIATA HYBRIDS

From crosses of *L. sprengeri* and a fertile strain of *L. radiata* made in 1954 and '55, I began to get bloom in 1961, and through the current year (1963) have had some thirty scapes. They appear in August over a period of two to three weeks, covering the season when their parent species are also blooming. Varying among themselves in color, and to a lesser degree in form, they make a most interesting and beautiful display. One distinctive form has fairly narrow, smooth-edged segments of rich, dark purple-red (a good color reproduction of it appeared in the September, 1963 *Horticulture Magazine*). Others range through shades of rose to fairly light pink, but practically always with a faint purplish or lavender tinting. As flowers age, strong violet markings develop at the segment tips, no doubt an inheritance from the blue-tipped *L. sprengeri*. Segments vary in width and some are deeply

colored along the midribs, but there is very little of the crisping and crinkling of edges so conspicuous in *L. radiata.*

Most umbels carry seven flowers, but there may be fewer or more, and they vary from about 6 to 7½ inches across, from tip to tip of extended stamens. The accompanying picture of "parents" and "children" (fig. 14) shows how the hybrids appear intermediate in form between the species. Since *L. sprengeri* and *L. radiata* do not at all resemble each other, the hybrids create a "new look" in the genus; they are unlike any other lycoris I have observed.

Regrettably, in spite of the great hardiness of *L. sprengeri*, the hybrids seem more susceptible to winter damage than even *L. radiata.* They make foliage growth in the fall, in the manner of *L. radiata*, and the bluish green leaves are hurt by near zero weather. In fact, though bulbs survive under outdoor cultivation here in Tennessee, I have never had one of them to bloom. All my flowers are on bulbs grown in a cold-frame protected by a plastic-covered sash in winter. I think they will prove satisfactory in Mid-South and Deep South gardens, but will need protection wherever winter temperatures consistently drop to 5 degrees or lower. I still have more than 100 bulbs to flower and am hopeful that some individuals may prove hardier than the average.

Incidentally, if you have *L. sprengeri* and a fertile *L. radiata* (I presume it is really *L. radiata* var. *pumila*), the cross is easy to make, using either one as the seed parent. My seedlings with *L. sprengeri* as the seed parent grew off a little faster and were first to bloom, but now that a dozen or more of the reciprocal cross have also flowered, I can tell no difference between them; that is, the same variations occur in both lots. It is of interest, too, that the hybrids are highly fertile to their own pollen; and I have crossed them back successfully on both parents and on *L. haywardii.*

In previous writings in this and other publications I have used the term "Sprenrad Hybrids" as a convenience to designate these crosses. In the present issue of Plant Life they are given the permanent name, *L. x jacksoniana.*

OTHER CROSSES

For any who may wish to try lycoris hybridizing, I will repeat that it is a fascinating activity and one can still get into "on the ground floor." The one requisite is enormous patience for lycoris seedlings take a long time to flower (I haven't had one to bloom short of six years). It is true that our cultivated stocks of *L. squamigera* and the common September-blooming *L. radiata*- and in my experience, *L. incarnata*, *L. caldwellii*, *L. houdyshelii* and *L. elsiae*—appear to be completely sterile and thus useless to the would-be hybridizer, but it is possible now to get a fair number of seed-bearing kinds. They all seem to cross readily with each other. To date I have made the following crosses and have at least a few seedlings of each coming along:

L. chinensis x L. "cinnabarina"
L. haywardii x **L. chinensis**
L. haywardii x **L. sanguinea** and the reverse

L. haywardii x L. "sperryi" and the reverse
L. haywardii x **L.** x **jacksoniana**
L. radiata x **L. haywardii**
L. radiata x **L. chinensis**
L. radiata x L. "sperryi"
L. radiata x **L. sprengeri** and the reverse
L. radiata x **L.** x **jacksoniana**
L. radiata x **L. traubii**
L. sanguinea x L. "sperryi" and the reverse
L. sprengeri x **L. haywardii**
L. sprengeri x L. "sperryi"
L. sprengeri x **L.** x **jacksoniana**
L. sprengeri x **L. traubii**

The L. "sperryi" is unidentified Chinese species; see page 77, Plant Life 18, 1962.

Only the *sprengeri-radiata* seedlings have flowered thus far, but some of the others are five years old, and I look forward with eagerness to their blooming during the next few years.

Cross pollinating lycoris flowers is very simple. All anthers must be removed from the seed parent flower while it is in the bud stage, before pollen is released, to prevent self pollination. Pollen of the male parent is brushed onto the stigma of the seed parent flower; I do this on several sucessive days, beginning when blooms first open, but the first application is probably sufficient. Seeds are harvested in fall and planted immediately in pots or flats kept in a cool greenhouse. After two years in the containers, seedlings are transferred to the coldframe for growing on to flowering size. Undoubtedly there are other equally satisfactory methods for handling seeds.

NEAR WHITES

For a number of years it has been possible to buy from mail order dealers as well as garden centers and even dime stores over the country lycoris bulbs under labels such as "White," "albiflora," "alba" and the like. When these bloomed they have always produced pretty flowers but if one ever turned out to be truly white, news of it has escaped me. With typical spiderlily form, similar to *L. Radiata*, they tend to vary in color somewhat, depending partly on temperature and light exposure at the time of flowering. In general the coloring involves soft pastel tints of cream, pale yellow, buff, salmon and pinkish—often with a deeper pinkish line along the middle of segments. Commonly they fade close to white a few days after opening.

Seeing a few here and a few there in different gardens and in different locations on my own place, I thought for years that they were probably all the same lycoris, the small differences noted among them being due to soil, light or some other cultural factor. To remove doubts I transplanted all of my stocks of this general type into one coldframe where they could grow under their various labels within a few inches or feet of each other under uniform conditions. Incidentally, they have prospered greatly and flowered freely in the frame which is covered with a sash in winter, for they are less hardy than *L. radiata* and really were never satisfactory bloomers when grown outdoors here.

Now, after checking the blooms carefully through several seasons,

I am aware that in spite of a general over-all resemblance, different forms do exist. Mainly these fit into three groups, and it may clear up confusion if I list names under which I received bulbs, sources and dates, and the result of bloom comparisons.

First is a large group—a majority of the bulbs, in fact—which came under many names but have proved to be identical; they are the soft salmony tinted type named *L. elsiae* by Dr. Traub in Plant Life 14, 1958. In this group are "L. radiata alba," from Bob Anderson, Los Angeles, Calif. (1948); "L. radiata alba," from Rex Pearce, Moorestown, N. J. (1950); "L. radiata carnea," from Pearce (1951); "L. alba," from San Francisco Nurserymen's Exchange, through Wyndham Hayward, Winter Park, Fla. (1951); "L. albiflora carnea," from Cecil Houdyshel, La Verne, Calif. (1952); "L. alba," from Growers Exchange, Farmington, Mich. (1952); "L. albiflora" (two out of three bulbs), from Mrs. U. B. Evans, Ferriday, La. (1959); "White No. 3," from B. Y. Morrison, Pass Christian, Miss. (1961).

A second group has flowers larger than the *L. elsiae* type, broader segments, crisped and reflexed, and little if any pinkish influence in the color but rather a pale, soft yellow throughout, which gradually fades toward white. It is an extremely pretty lycoris. Photographs of this form and of *L. elsiae* appear on pages 80 and 82 of Plant Life 18, 1962, and it is easy to see differences between them even in the black-and-white pictures. I received bulbs of this group as "L. albiflora" (one out of three bulbs), from Mrs. Evans (1959); as "White No. 1," from Mr. Morrison (1960); as "L. albiflora," from Mr. Morrison (1961), along with a note that this was from the original stock he received under this name from Japan while he was with the USDA in 1940; and as "Cream No. 1," from Caroline Dormon, Saline, La. (1962). Miss Dormon wrote that her bulbs came nearly 20 years ago from Col. Russell Wolfe, Orangeburg, S. C., simply as a "White" lycoris.

A third group is what catalog writers might call "improved elsiae," because they are truly bigger and better than the *elsiae* type. On strong scapes 20 or more inches tall, these have umbels up to 8½ inches across. The color is not very stable but runs through apricot shadings definitely to pink. A well developed scape is one of the finest lycorises imaginable. I have these in one small purchase of "White" lycoris from a local garden store (1959), where the owner advised me they had come from Van Waveren, in Holland, billed as "L. alba"; and also in two lots of bulbs from Mr. Morrison (1959 and 1961) which he had received as "L. albiflora carnea" from the Walter Guille wholesale bulb firm, Syosset, L. I., New York.

Well over 90% of my near white lycorises fit into the three groups described above. There are a few individual bulbs, including a small-flowered deep pink one from Mr. Morrison, about which I am uncertain, and there are still others that have not flowered. All of these make lush leaf growth, starting in the fall in the manner of *L. radiata*, but leaf blades are perhaps twice the size of *radiata* leaves. Although not exactly common, near whites are well distributed among bulb fanciers

in the South. Probably there are other forms I haven't seen. We all enjoy them but I am sure there are other gardeners along with me who would like to know what to call them. At present the names are hopelessly confused.

A NEW YELLOW—PERHAPS

In October, 1962, a local garden center received lycoris bulbs from Springtime Bulb Farm (wholesalers), Lebanon, Ohio. They arrived in wooden cases stenciled "L. aurea" and "Grown in Japan." But printed cards enclosed in the cases said: "New Import—Hardy Golden Spider-lily—Plant 5" deep in semi-shade or sun. Bloom August in North, July in South. Height about 2 feet. Will bloom year after year if left in ground."

For years my sense of curiosity has impelled me to buy samples of bulbs like these, although experience has shown that nearly all the Japanese "aureas" turn out to be *L. Traubii*, which is definitely *not* hardy here in Tennessee. But I was intrigued by the "New Import" and "Hardy" claims for these bulbs and so bought a couple of dozen at first and later an entire case (they were not expensive).

I've been able to observe these now through the 1963 growing season from foliage alone—none bloomed. Judging from the leaves, there were a few *L. Traubii* bulbs mixed in, but most of these really are something different. If the year's performance is typical, they make foliage in late winter and very early spring, in the manner of hardy types such as *L. squamigera*, and the leaves actually look like those of the rare hardy yellows, *L. chinensis* and L. "sperryi."

Of course these may turn out to be disappointing in flower, but they strike me as being worth watching. They really may be a hardy yellow lycoris—perhaps *L. chinensis* or L. "sperryi" or something similar. I suppose these bulbs were marketed all over the country, and I hope others who have experience with them will send reports to Dr. Traub.

EFFECT OF HARD WINTER

As in many other localities, the 1962-'63 winter gave our Nashville, Tennessee area the coldest temperatures ever recorded. Mid-December and late January cold spells brought night temperatures of 4 below zero twice, 6 below, 7 below, 13 below and the all-time record of 15.2 below. All my outdoor-grown lycorises that make foliage in the fall were badly hurt. Leaves would have killed off entirely had there not been 3 or 4 inches of snow protection when the bitterest weather came. Leaf blades "burned" down to the snow line, and as a result there were very few blooms on the common *L. radiata* in September and none at all on my cherished white *L. houdyshelii*. The fertile *radiata* flowered fairly well; leaves were damaged all right, but this type always seems to bloom, anyway. No bulbs were killed as far as I can tell; all appeared to be sending up leaves as usual in the fall of '63.

The winter certainly proved the value of a coldframe for questionably hardy species. All my *L. elsiae* bulbs and other near whites are

in a large frame with a plastic sash cover. It is not a tight frame at all and there was a little whitening of leaf tips by the extreme cold. But foliage survived and bloom was almost normal.

The hardy species that make foliage here in late winter and early spring were very puzzling in performance. All made excellent leaf growth, as it didn't start until our severest weather was over. But summer bloom was below par for several of them. There were nice blooms on *L. squamigera* and *L. sprengeri* but not half the usual number of scapes. Oddly enough, it was possibly the best year ever for L. incarnata, which flowered freely in all locations. *L. sanguinea* and *L. caldwellii* were about normal. Experience is showing that these do best under deciduous trees (mine are under dogwoods). They get sun during the foliage cycle but are shaded at flowering time.

L. chinensis, the rare hardy yellow, of which I received one bulb in 1958, produced a scape; it has not failed to flower now in three years. Just a foot away from it are several bulbs of L. "sperryi," the other hardy yellow, but they didn't bloom. However, Miss Aileen Bishop, who has the original stock of L. "sperryi" here in her garden, had four scapes—not as many as usual.

We do not know whether to attribute the scarcity of bloom on certain species to the cold winter or to abnormal spring weather. The usual April showers never came; instead there was a hot, dry month with 26 rainless days, three of which set all-time records for *high* temperatures.

MISCELLANEOUS NOTES

In correspondence with Prof. Ei-ichi Takemura, in Japan, Mr. B. Y. Morrison received a color slide and pressed flower of what is purported to be *L. straminea*, and I have been privileged to see them. The slide shows an umbel with three flowers open and four buds. Color appears to be ivory or very pale strawy yellow with no markings. Segments look fairly broad with smooth edges—no undulations—and tips are somewhat reflexed. Segments are longer than stamens but the pistil extends beyond them. The picture does not conform to descriptions of *L. straminea* I have read, but it is an interesting flower and different from any species I know. Unhappily, Prof. Takemura advised that he lost all of his bulbs in the 1958 Kanogawa hurricane and has been unable to locate any more in all of Japan.

Mr. Robert D. Goedert, Jacksonville, Fla., amaryllis dealer and fancier of many amaryllids, has been getting lycoris bulbs from Japan which will be interesting to watch. I have several test plantings, including bulbs he received as "L. Vermillion" and "L. aurea Vermillion." Future bloom seasons will reveal what they really are.

Some bulbs I received back in 1957 from H. E. Saier, Dimondale, Mich., finally bloomed in September of this year. I believe Mr. Saier had imported them from India and they were labeled simply "Nerine."

They turned out to be a very nice form of *L. radiata*—apparently the same as those grown widely over the South.

Bulbs of "L. purpurea" that I have had from many sources have always turned out to be *L. sprengeri* upon flowering. There are still three lots of "purpurea" that haven't bloomed, and I keep hoping for something different, but the foliage looks just like *L. sprengeri.*

If you read this report and get the impression that names under which lycoris bulbs are sold mean little, please do not feel hard toward American dealers. Many of them are my good friends and I know they do the best they can. I am grateful for their making some very beautiful flowers available to us. Most lycoris bulbs marketed come from Japan. Economically, it is not usually possible for retailers to test grow and flower the bulbs before any are sold, so they have to rely largely on sometimes inaccurate information from suppliers. If even our advanced plantsmen and botanists are unsure about much of the lycoris nomenclature, you can hardly expect collectors, growers, shippers and retail dealers to be better informed.

EDITORIAL NOTE.—The fertile so-called *Lycoris radiata* var. *pumila* is in fact the biological norm (diploid) of *L. radiata*, and should be indicated as *L. radiata* var. *radiata.* The larger, infertile form is a triploid.

Hardier forms of *Lycoris* x *jacksoniana* can be expected among the progeny of selfed individuals; and also from the back-crosses on *L. sprengeri*, and crosses with other hardier species.—*Hamilton P. Traub*

AMARYLLIS ROUND ROBIN NOTES, 1963

MRS. FRED FLICK, *Chairman, Carthage, Indiana*

A Round Robin is a letter club, consisting of ten to twelve members. A Robin should make a round in three months. When the Robin reaches a member he takes out his old letter; and includes his new letter. At the time the Round Robin is mailed to the next member, a courtesy card, or note is mailed to the Director of the Robin. This is the only way that a director can know the location of the Robin.

A member sends the Robin on in seven days, or less if possible. In case of illness, a member of the family should be instructed to mail the Robin on to the next member.

The postage is usually from fifteen to twenty cents on the Robin.

[The following notes were extracted from Round Robin letters by the Chairman of the Amaryllis Round Robins.—Editor]

Len Woelfle.—"It has been an exciting year for me; as three new *Hymenocallis* hybrids bloomed for the first time. One was a new golden yellow with a greenish overcast. It was much darker yellow than 'Sulphur Queen'. The greenish glow gives excitement to the flower. I have named it *Hymenocallis* clone 'Green Gold'. It is a back cross of *H.* clone 'Pax' on *H.* amancaes.

The second one to bloom has been named *H.* clone 'Fiesta'; and it is a glorified 'Festalis', if that is possible. At least it is different; a little larger in all parts; a more robust plant; and the umbel is fan-shaped like *narcissiflora* instead of radial, like the usual Festalis."

Opal R. Flick—"Len Woefle's hybrid *Hymenocallis* clone 'Pax' bloomed beautifully for me in early June. Our Garden Club Flower Show was to be the middle of June. How I wished that it had waited to bloom for the Show. Then to my surprise, it sent up a second scape; and the day of the Show had seven lovely blooms and buds.

I entered it as a specimen Ismene. It really stood out, when compared with the others entered. Naturally, it won the blue ribbon."

LYCORIS HYBRIDS REPORTED FROM JAPAN

Ei-ichi Takemura, *Tokyo University of Education, Otsura, Tokyo, Japan*

HYBRIDS BETWEEN LYCORIS AUREA AND L. RADIATA

[The following summary is taken from an article published by Dr. Takemura in the Botanical Magazine, Tokyo, Vol. 75. Pp. 324—330. 1962.—*Editor*]

SUMMARY

1. Morphological and cytological studies were carried out on F-1 plants raised from *Lycoris aurea* Herb. ($2n = 14 = 8V + 6R$) x *Lycoris radiata radiata* (syn.—*L. radiata* var. *pumila* Hort.), $2n = 22 = 22R$.
2. The morphological characteristics of the F-1 hybrids are intermediate between the parents and resemble closely the natural hybrid, *L. albiflora* Koidzumi.
3. The chromosome number in somatic cells of the F-1 plants are $2n = 18 = 4V + 14R$, i. e., the sum of the numbers in the gametic cells of both parents.
4. At the 1st metaphase in microsporogenesis of F-1 plants, 4 heteromorphic triplets and 3 bivalents are usually observed.
5. This artificial hybrid is almost completely similar to *L. albiflora* Koidzumi in morphological characters, karyotype, chromosome behavior in meiosis, etc. These facts apparently prove that the view of Inariyama that *L. albiflora* Koidzumi may be a natural hybrid between *L. aurea* and the diploid *L. radiata radiata* (syn. *L. radiata* var. *pumila* Hort.) is correct.

AMARYLLIS BREEDING REPORT, 1963

C. J. Crochet and Mrs. J. S. Barry, *Rt. 1, Prairieville, Louisiana*

Mature seeds from selected crosses are planted in six-inch red clay pots each spring. The seedlings are kept growing in the greenhouse for a full year and planted in open beds in June and July of each

year. The beds are five feet wide and seedlings are spaced four inches apart by using a board with notches cut at four inch intervals. A bulblet is planted so that the entire bulb is covered with soil. Amaryllis beds are tilled before planting, and we incorporate bone meal, cow dung, German peat, and sand, mixing well with the soil. Beds are 100 feet long and are 4 inches higher than the surrounding soil surface, to allow for good drainage (see Fig. 15).

Fig. 15. General view of hybrid Amaryllis beds of C. J. Crochet and Mrs. J. S. Barry at Prairieville, Louisiana, 1963.

For the first year, weeding the beds is a necessity, but for the following years, weeding is at a minimum because the amaryllis leaves tend to shade the beds, thus discouraging weed growth. Growing from 4 to 5 thousand seedlings per year makes close planting necessary as growing space would soon be exhausted. Each summer seedlings are shaded with sesbania, which gives dappled shade. Sesbania is planted from seed in the middle of the beds and thinned to one plant per five foot interval. The following spring they are easily removed from the beds, leaving a valuable nitrogen supply from their decomposed leguminous root systems. Each November, the *Amaryllis* beds are mulched with three inches of sugar cane waste, which is received shredded and packed in bales. This mulch is used as a protection against cold damage. It does not pack, it allows for rain penetration, and

provides warmth through its heat of decomposition. This mulch is replenished each November.

The sugar cane waste serves four purposes: (1) it keeps the ground surface cool during the summer months (2) it adds organic matter to the surface of the soil (so important in successful *Amaryllis* culture), (3) it insulates the beds during winters, and (4) it keeps weeding to a bare minimum. With this procedure, no bulbs were lost during the extremely cold winters of 1962 and 1963.

"Fertilome" is applied in March of each year at the rate of 25 lbs per 5 x 100 foot bed. Lush leaf growth does not permit more than one application per year and "Ra-Pid-Gro," a foliar nutrient is applied each month until October, when the last application is made.

This procedure has resulted in spectacular bulb growth and many seedlings bloom in three years.

All seedlings are kept and through the years about 50 have been segregated for further performance evaluation. These will be vegetatively propagated. All have the worthy characteristics of color, size, texture, uniqueness, growing ability, and hardiness. (see Fig. 16).

Fig. 16. Crochet and Barry hybrid Amaryllis—upper left, red and white; lower left, rose and white; right, huge, heavy-textured, full form white (from white Dutch x 'White Giant').

No seedling is considered as a subject for propagation unless it conforms to well defined standards. This group includes the color range from white through the picotee types, striped red and white, orange and white, salmon, rose, pink, scarlet, and darkest red.

What follows are some of the principles we used in producing bulbs from seed: (1) Work toward some well planned objective; (2) Use only the best seedlings or named varieties in making crosses; (3) A cross from two inferior flowers will invariably produce inferior progeny; (4) With but few exceptions, selfs are not desirable in upgrading the quality of *Amaryllis;* (5) Never produce seeds on first year blooms (the drain of energy may keep the bulb from flowering the following year); (6) No bulb should be forced to make seed for any two consecutive years; (7) Carefully label all crosses as to pod and pollen parent. As a result, those which produce superior progeny can be duplicated in the future.

FLOWERING OF AMARYLLIS CALYPTRATA HYBRIDS

W. QUINN BUCK, *Los Angeles State & County Arboretum, Arcadia, California*

On October 22, 1962, the first flower on one of our *Amaryllis calyptrata* hybrids began to open. It had been felt that the seedlings, sown on June 15, 1961, must be far from blooming, even though growth had been vigorous; so it was a great surprise to discover an unnoticed spike.

This hybrid of 'Nivalis' (Ludwig) x *Amaryllis calyptrata* was an interesting blending of the parents. Our photograph (Fig. 17) shows the dominance of the *A. calyptrata* in general shape; as the flowers matured the lower petals and sepals curved inwardly even more, and the other segments undulated as in *A. calyptrata.* The green color was not evenly distributed, going especially to deepen and extend the green throat area of the white parents. The flower was dull white, with large green throat, and with some reddish color on the reverse. The texture took on some of the *calyptrata* smoothness. The pink stamens and pistil of *A. calyptrata* carried through, to give a spot of color.

Of the fourteen seedlings from this cross a second flowered soon after the first, with an interval before additional spikes appeared. The 1963 crop of spikes has been quite good, and up to this time (August 15, 1963) most of the fourteen have flowered at least once, and some have had as many as three and four spikes scattered over the months. Many of the later flowers have been surprisingly wide-seged, with a flatter form like that of the Dutch hybrid parent. Some spikes have shown three buds, while others have had only two. Most of the seedlings began producing offsets very early, and they now have their pots crowded.

Of a second cross, 'Ludwig's Dazzler' x *A. calyptrata*, about half of the 204 seedlings show many offsets. This producing of offsets

cannot yet be correlated with other characteristics. This second cross was also planted June 15, 1961, but up to now most of the progeny is unflowered. One spike was a surprising picotee; a narrow pink line edged all of the tepalsegs. Two spikes have shown interesting brown lines in the petal midribs. The foliage of this second cross seems a darker green, while the small group shows a tendency to be yellow-green.

Fig. 17. Hybrid between *Amaryllis* clone 'Nivalis' (Ludwig) and *A. calyptrata*, an interesting blending of attributes of the parents, made by W. Quinn Buck of the Los Angeles State and County Arboretum, Arcadia, Calif. Photo by Jack V. McCaskill.

Earlier observations of a dominance of *A. calyptrata* in leaf width and shape do not seem to be holding true as the bulbs mature.

So far no individuals have been fertile when selfed, cross-pollinated or back-crossed, suggesting consistent triploidy as a strong possibility that should be investigated.

THE OUTSTANDING ANGELL HYBRID AMARYLLIS

W. QUINN BUCK, *L. A. State and County Arboretum, Arcadia, California*

The *Amaryllis* hybrids developed at Loma Linda University by E. A. Angell have both horticultural and historical interest because of the source of the original bulbs from which they have been developed.

In 1934 Mr. Angell bought three bulbs from the Henderson Experimental Farm near Fresno, Calif. One of these, a red and white hybrid of the Luther Burbank strain, flowered and set seed. Three

Fig. 18. View of the Angell hybrid *Amaryllis* field near the tennis court at Loma Linda University, showing many of the Angell near-white hybrids.

years later a solid red amaryllis of the Burbank material was added to the Angell breeding stock. It was these two Burbank bulbs which were the sole foundation of the Angell strain developed during his years at Loma Linda University, Loma Linda, Calif.

When Mr. Angell arrived at the University, where he was superintendent of grounds for twenty-three and a half years, until his retirement in 1961, he brought with him seed pods from the two original bulbs. These seed were planted and became the first generation of many successive years of breeding. Mr. Angell's sixteenth generation is now ready to be planted in the open field. (see Fig. 18).

Color, form, hardiness, free-flowering quality, and vigor have been prime considerations when Mr. Angell has chosen parents for his many

crosses. A tremendous range of color from pure self-colored reds and oranges, through pinks and occasional lavenders and greens, to clear near-whites of exceptional quality, has resulted. The color patterns and variations in form are indicative of Mr. Angell's working to get them. (See Fig. 19.) He has sought "red" foliage in many of his hybrids, and the result is great numbers of clones with handsome bronze foliage. Many spikes produced six buds, and the most floriferous have had as many as eleven or twelve buds.

Fig. 19. Closer view of some of the Angell *Amaryllis* hybrids, grown at Loma Linda University, Loma Linda, Calif.

An example of Mr. Angell's keen interest in hardiness is his selection last winter of some eighty clones that remained green and only slightly damaged after unusually heavy frosts, and temperatures as low as 20° F. From crosses involving this group he is hopeful of getting even greater hardiness than his strain has shown up to now. Among the selections with exceptional hardiness, Mr. Angell found some of his bronze-leaved "pets"; so this character can be included in much of this line of breeding.

In evaluating Mr. Angell's hybrids in the field, it seems that his near-whites are the most outstanding for quality, although this may come from his having dug more of the reds for sale. It is quite fair to say, though, that the Angell strain is unquestionably the best commercial strain being grown in California, and its origin in the Burbank strain gives an added interest.

INTERRELATIONSHIPS OF SOME GARDEN CRINUMS

L. S. HANNIBAL, *Fair Oaks, California*

We owe Miss I. C. Verdoorn of Pretoria a sincere vote of recognition for her clarification of the status of *Crinum macowanii* Baker because J. G. Baker's original description of 1878 was unfortunately confused with *C. moorei* from Natal. And of equal importance we can report that *C. macowanii* was used some fifty years ago by Luther Burbank for breeding purposes. The hybrid *C.* clone 'Luther Burbank' which he developed has now been confirmed to be a cross of *C. macowanii* with *C. yemense*.

In the April 1956 issue of the South African Journal of Botany Miss Verdoorn reviewed and properly described *C. macowanii*. She found that Baker's description of this plant which was published in the Gardeners Chronicle of 1876 was confused with *C. moorei*, but that the Kew Herbarium lectotype: Mac Owan 2122(K) was typical of the *C. macowanii* species native to the Transvaal. Her study is quite comprehensive in that it covers a number of the geographical variants found in South Africa and provides a proper description of the species.

C. macowanii resembles *C. bulbispermum* in a number of general respects, but the plant is of lower stature and the glaucous recurved foliage is slightly broader and seldom more than twenty inches long. The scape is quite sturdy and rarely taller than 14 inches. The eight or ten blossoms have very heavy tepaltubes and short pedicels. Their shape is like that of a slender white "Cottage Tulip" with the keels of the tepalsegs colored a distinct rose red. The anthers are black and the ripe fruit are beaked.

The species is scattered over an area ranging from Port Alfred on the Indian Ocean up through Natal and the Transvaal to Johannesberg and north to the mountains of south Rhodesia. The high Transvaal forms are quite winter hardy as they experience some frost. The plants are normally found in dry stream beds. In habitat it can be considered a desert species.

Experience here in the Sacramento valley suggests that the high Transvaal forms are quite winter hardy if given good drainage. The plants desire full sun and only an occasional watering. The bulbs flower in early July or August, normally producing two scapes. Those received from the highest elevations are the earliest to flower. Seed sets without difficulty if pollen is employed from clones derived from different localities. Seedling plants offer no difficulty in culture except that they are quite slow growing and require some protection in winter until the bulbs reach appreciable size. The plants probably take ten years to reach maturity. Offsets have never been observed.

Crinum macowanii overlaps in a number of areas where *C. moorei*, *C. bulbispermum*, *C. graminicolum* and other species are normally found. We would expect some crossing in the wild with transitional forms being reported if the species were compatible. Apparently such do not occur in sufficient quantity to attract attention. Breeding

experience by the writer tends to bear this out—*C. macowanii* takes on *C. bulbispermum* with considerable difficulty and the hybrids are very slow growing and difficult to flower; *C. macowanii* on *C. Moorei* produces a slow growing plant which resembles *C.* clone 'Louis Bosanquet,' but with much broader foliage. In view of the fact that *C.* clone 'Louis Bosanquet' has dark grey pollen and other features which tend to point to *C. macowanii* genes being present we had wondered for some time if *C. macowanii* was involved. It appears that *C.* clone 'Louis Bosanquet' may be a cross of *C. bulbispermum* and *C. macowanii.*

However, the major surprise came with the crossing of *C. macowanii* and *C. yemanse.* The seedling vigor is particularly noticeable in those hybrids involving *C. yemense* (Burbank's selection) possibly because the Burbank plant may be a tetraploid as it is larger than the van Tubergen form (Plant Life *18*, p.30, 1962). The foliage of the latter *C. yemense* x *C. macowanii* is uniquely strap shaped, being about three inches wide over the full forty inch length; it is borne semierect on a 18-inch high pseudo neck and is slightly recurving. The final realization that this plant and the old *C.* clone 'Luther Burbank' were identical was quite unexpected, but it appears likely that Luther Burbank did cross *C. yemense* with a *C. macowanii;* however, if he did, he apparently used a low veldt form as his clone requires warm weather to flower properly. Both Burbank's and the writer's plants have waxy white, tulip shaped blossoms on long curved tepaltubes. The anthers are dark, the hybrids fertile and the fruit beaked. Since the writer has grown F-2 and F-3 seedlings from the Burbank clone and has noted quite a range of segregates it should be of no surprise to find that some of the segregates are quite like *C. macowanii.* In fact it was such F-2 stock backcrossed onto *C. bulbispermum* which gave rise to the writers *C.* clone 'Cape Dawn' which was described in the 1961 Plant Life. This apparent discovery concerning the parentage of *C.* clone 'Luther Burbank' now completely supercedes the statements made by the writer concerning it in Herbertia *9*, p. 150. It is however, an interesting fact that *C. macowanii* and *C. yemense*, which seemingly do not resemble each other, appear to have a relatively close relationship or origin. This view is supported by the fact that the *C.* clone 'Luther Burbank' hybrid is the only one thus far encountered by the writer which produces random F-2 generation seedlings typical of a close or intra-specific hybrid. A restudy of the plants shows some common features. It is uncommon, though, to find cases where breeding discloses relationships that morphology neatly disguises. Since these plants appear to be of a common source it would be of interest to look for related species in Rhodesia, Kenya, Tanganyika or Ethiopia. There is a plant around Lake Victoria which resembles *C. yemense*, and *C. abyssinicum*, *C. Kirkii*, *C. scarbrum* and others need reinvestigation.

Further crossings by the writer has disclosed that *C. crispum* (now considered a form of *C. Polyphyllum* according to Cythna Letty in her text) will not cross with *C. macowanii*, despite the fact that there are many similarities including beaked fruit. Attempts to cross *C.*

macowanii with *C. moorei*, as mentioned above, have not been overly successful. Growth is slow and the seedlings are spindly. However, *C.* clone 'Luther Burbank' F-2 seedlings take on *C. moorei* with more ease. The foliage is long and uncurved, but at best it will take the bulbs ten years to reach flowering size. This latter behavior is quite surprising as the presumed cross of *C. moorei* and *C. yemense* (Burbanks 'White Queen') is quite vigorous. We can only conclude that *C. moorei* and *C. macowanii* have little attraction for each other.

Most crosses of *C. macowanii* on *C. bulbispermum album*, which is probably the *C.* clone 'Louis Bosanquet' cross, have not been found

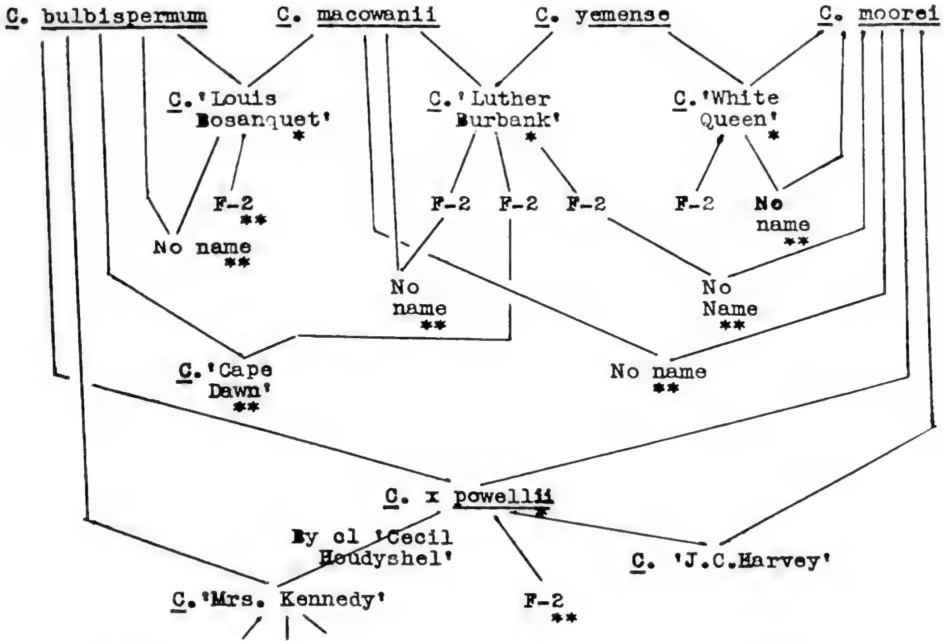

Fig. 20. Experimental confirmation of interrelationships of some *Crinum hybrids.* * Existing hybrids duplicated by writer by recrossing presumed parental species. ** New hybrids developed by writer.

of sufficient value to keep, but crossings involving the Orange River and Kimberley red-flowered form of *C. bulbispermum* are quite dark in color, and are considerably hardier. It is possible that the bulbs which the writer once saw growing in Berkeley were of this hybrid composition in lieu of being red *powelli*. The plants multiply rapidly and the foliage is half the width of the *C.* x *powelli* crosses.

The writer's 'Cape Dawn' hybrids, which are *C.* clone *'Luther Burbank'* crossed on *C. bulbispermum* differs from the Bosanquet type of cross mostly in vigor and size. The latter has foliage some 8 feet long and a single bulb often makes four or five scapes with 18 or 20

blossoms in a single season. The pollen is sterile. In contrast the smaller 'Louis Bosanquet' cross has viable pollen and occasionally produces seeds. The umbels are not what one could call outstanding.

In the 1962 issue of Plant Life the writer pointed out the value of determining the interrelationships of Crinum species and hybrids if breeding progress was to continue. The use and relationship of *C. macowanii* to the other Cape species is a distinct revealing. Similarly, *C. yemense* may have had far more use than generally conceded in the breeding field. It is now possible to pinpoint the parentages to a number of our *Crinum* hybrids. The chart shown in Fig. 20 outlines the interrelationships discussed above, and we can gain some indication from this as to future breeding breakthroughs. Apparently most hybrids have viable pollen and one can cross back onto a number of the species to obtain additional hybrids. If one backcrosses onto a parental species there is a good probability of the backcross being very hardy and capable of producing some seed. *C.* clone 'Mrs. Kennedy' represents a *C.* x *powelli* 'Cecil Houdyshel' backcrossed onto *C. bulbispermum album* and as such is quite a potent breeder with considerable promise of future use. Backcrosses of *C.* clone 'White Queen,' *C.* clone 'Luther Burbank' and others are also on the way and if viable as expected then additional breeders can be contemplated.

One item of interest which requires further study is Dr. Edgar Andersons hypothesis that an F-1 hybrid is the geometrical average of all dominant genes. When one examines the bulbs, foliage, and flowers and habits of *Crinum* hybrids one eventually discovers the dominant combination of features which are inherited from the parental plants; and in all instances so far examined *Crinum* hybrids are in accord with Dr. Andersons views. The long, recurved, channeled characteristics of *C. bulbispermum* foliage may dominate over the *Moorei* foliage in most *powelli* hybrids, but when closely examined the *powelli* foliage is broader, less recurved and less channeled. One can cite a great number of other instances, and the only factor which seemingly confuses the issue is hybrid vigor, or lack of vigor. This attribute increases or decreases a plants physical proportions sufficiently to mislead the evaluator unless he is aware of such behaviorism and is on the alert to take it into consideration.

SECOND HYBRID GENERATION SEEDLINGS OF **ALSTROEMERIA X ORPETIAE**

[Selfed seeds of *Alstroemeria* x *orpetiae* with lilac colored flowers, have been distributed to various correspondents. Results obtained by two growers with these seeds are reported here. It is hoped that others who have received them will report in the Amaryllis Year Book.—*Hamilton P. Traub*]

1. Report from Grant V. Wallace, **Berkeley, California**

In July, 1961, Dr. Hamilton Traub kindly mailed me some seeds of an Orpet *Alstroemeria* hybrid: *A. violacea* x *A. pelegrina alba*, collected from F-1 selfs. As usual, not many germinated, but one sturdy plant produced by these seeds bloomed in the spring of 1963. The flowers were very fine: large, and creamy-white, with very few spots—one might truthfully say, with *no* spots. This plant had a rugged career: snails ate it to the ground the first year. However, the tubers produced a perfectly good cluster of stems in 1963, with the result noted above.

2. Report from Burr Clouette, **San Diego, California**

In 1961, seeds of the Orpet *Alstroemeria* hybrid from self-pollination were received from Dr. Traub. These were planted and in due course fifteen seedlings appeared. Up to 1963, three seedlings have bloomed. Two are much like the parent, that is flowers lilac with darker blotch and streaking. The third has white flowers with small yellowish or chartreuse blotch on the two upper tepals, and a few greenish markings in and around the blotch.

The leaves of all of the seedlings are dark glaucous green, but the stems of the two seedlings with colored flowers are reddish whereas those of the seedling with the white flowers are light green.

A NEW BI-GENERIC HYBRID— X SYDNEYA MORRISII

KATHERINE L. CLINT, *Brownsville, Texas*

We must thank a sudden lucky impulse for this beautiful new hybrid, for neither my husband Morris nor I are given to promiscuous crossing in the Rain Lily group. Someone had requested seed of *Habranthus immaculatus*, which is not always easy to supply since the species does not bloom heavily and usually requires hand pollination. Even this is tricky because the interval between the opening of the anthers and drying of the pollen beyond use is very short. On this particular day, I had checked my lone blossom of *H. immaculatus* frequently but misjudged the time and found that I had lost my opportunity. Thoroughly disgusted and disappointed, I suddenly remembered the flower of *Zephyranthes bifolia* in the greenhouse. This had been open for several days and when I discovered that the pollen was neither fresh nor plentiful I almost failed to use it. Actually, I think my action was inspired more by pique at the loss of *H. immaculatus* seed than optimism over the possibility of a bi-generic cross. I remember being quite surprised when signs of fertilization were soon evident. Had the flower been pollinated by insects before I applied *Z. bifolia* pollen or did we have prospects of a fine hybrid cross?

The capsule matured rapidly and produced an unusual number of seed—about 90, which were carefully planted and watched closely. This was on May 26, 1960. Germination was above average and the exceedingly rapid growth of the seedlings seemed to foretell their

hybridity. In August of the same year, about 65 bulbs were transferred to a long, deep flat filled with a rather rich, humusy soil mix. In this they grew apace and it was soon evident that we no longer need have any doubts of obtaining a true cross. The deep, shining green leaves (those of *H. immaculatus* are quite glaucous) were very similar to those of the pollen parent but already much longer and broader.

In the late summer of 1961, six of the larger bulbs (now about the size of a paper shell pecan) were potted in a standard 7″ clay pot, using the same rich soil with limestone chips added to the mix and a layer several inches deep of the same stone in the bottom for drainage. It was decided to keep these growing continuously in the greenhouse through the winter if at all possible, even though both parents need a dormant period. The remainder of the bulbs were planted in a raised bed in the shade house, where they received care until late fall when they were allowed to go dormant. We were to regret planting them here, for the severe freeze of January, 1962 and subsequent drought caused heavy damage. Some bulbs were lost completely and all were badly set back.

On January 6, right in the middle of the cold weather, a husky bud was discovered on one of the bulbs in the greenhouse. One can imagine the excitement in the Clint household. What would the flower be like? Surely, with two such beautiful parents, one couldn't lose. Due to the extreme cold, the scape developed very slowly. For almost a month, the bud sulked just above ground level and we were in constant fear of losing it. At last the weather warmed, the scape shot up unharmed and on February 7, the flower opened and we were delighted. It was indeed a lovely thing, resembling *H. immaculatus* in size and shape but the color was sensational. Though often seen in *Amaryllis* hybrids, it is completely new to the Rain Lily group—carmine rose RHS 621 to 623, with a white center and a small green throat. Spathe, scape and flower form were typical of *Habranthus* while the leaves now looked more like a small *Amaryllis* than either *Zephyranthes* or *Habranthus.* In April, one of the bulbs in the shade house bloomed. It was a larger, more open flower, with similar coloring except that the carmine rose was a much deeper shade. The early maturing of these two and about 8 other seedlings was not reflected in the group as a whole, since only a little over half of them have bloomed to date. Had all been kept in a healthy, growing state perhaps the story would have been different. The flowers have been very similar in appearance, although there is, of course, some variation in depth of color and form. The size of the blossoms has increased with the age and size of the bulbs, the average being 3″ and the largest more than 4½″ in diameter. An extra dividend is the year round growing and blooming habit.

As in most bi-generic hybrids, the seedlings appear to be sterile. Repeated attempts to self-pollinate, cross-pollinate with sister seedlings

(CONTINUED on page 34.)

4. AMARYLLID CULTURE

[REGIONAL ADAPTATION, SOILS, FERTILIZATION, IRRIGATION, USE IN LANDSCAPE, DISEASE AND INSECT CONTROL, ETC.]

EXPERIENCES WITH AMARYLLIS SPECIES

WILLIAM MORRIS, *89 Mills Street, Warners Bay, New South Wales, Australia*

After reading Dr. J. C. Smith's "Amaryllis Species Notes" in the 1962 Amaryllis Year Book, and his request for reports from other growers, I decided to write this article.

Since first becoming interested in *Amaryllis* about five years ago, I very rapidly acquired a major interest in the species and old or new interspecific hybrids. I grow the wonderful Dutch hybrids and enjoy them, but I always look for something different and that is what the species reveal.

There were very few *Amaryllis* species in this country—at least that I could locate in N. S. W.—so to begin with I had to try to obtain seeds of as many as possible from overseas, mainly from Brasil, Bolivia and the U. S. A. I received seeds of *A. aulica* from Mrs. Clint about four years ago and at present scapes are appearing for the first time on four bulbs. The half dozen or so seedlings have multiplied very rapidly by offsets and I now have clumps of dozens of bulbs. The bulbs were evergreen until last summer (it is now autumn here July 5, 1963) when they went completely dormant for about 8 weeks. This seems often to be the way with many seedlings. Going dormant announces that they are large enough to flower after going through the earlier "grand period of growth".

Amaryllis pardina flowered here last spring for the first time from a bulb I located in cultivation in Sydney. How long it has been in this country is not known, but it is not widespread. I was in Northern Queensland when it flowered. I was told that it was highly spotted.

I received *Amaryllis reginae* from Bolivia, and *A. calyptrata* from Brasil. The first is very vigorous and is now reaching flowering size. The larger bulbs have produced quite a crop of offsets. All offsets—*aulica, pardina*, and *reginae* have done well when planted in the ground.

With me, *A. calyptrata* has been much slower contrary to Mr. Buck's findings (Amaryllis Year Book, 1962, p. 131). My plants have not grown rapidly even under glass with feeding. When planted out in the ground they almost ceased to grow, and they have now all been put back into pots in the glasshouse (unheated) where they still grow slowly. One seedling seems different in a number of ways and has grown much better than the rest. As the seeds came from garden grown plants in Brasil, I am wondering if this one is a chance hybrid with another *Amaryllis* species in the garden. *A. calyptrata* seedlings have always gone dormant in summer whereas this one has not, and it also has pigmented leaves in contrast with the rest with plain light green leaves. Only inspection of the flowers later will solve this riddle.

Amaryllis evansiae from U. S. A. grown seeds has grown quite well. Now about 30 months old, two of them appear to be mature, and I am hoping for flowers in the spring. Dr. Smith reported his bulbs tended to rot or decline. Mine have not done this either in pots or in the ground. The two largest bulbs have been in pots all the time while most of the rest were planted out. As these did not respond by rapid growth after a season, they have been repotted and put back in the glasshouse. In potting these and other *Amaryllis,* I always use plenty of crocks—from 1/3 to 1/2 the pot height.

Amaryllis belladonna L., the American Belladonna, seeds were received from the U. S. A. and Bolivia at about the same time as *A. evansiae.* They have not been as rapid growing as the latter. At this time, only one bulb may be large enough to flower. However, they have not been difficult in any way, simply slow. They have been pot grown from the beginning—except for a few in the ground as an experiment. I feared that our winter rain, when they were dormant, might rot them. So far I can not comment on those in the ground as they have not been through a winter yet.

Amaryllis psittacina var. *decorata,* from Dr. Traub, has grown very well and is near flowering size I believe. I am waiting on this one with impatience as the description of its flower color intrigues me. *A. psittacina* var. *psittacina,* received only last year from Mr. Davis, has grown very well and looks half grown already.

A. vanleestenii (?), from Bolivia, has been the slowest of all from seeds. At the end of its second growing season its largest leaves are only $2\frac{1}{2}'' \times \frac{3}{8}''$.

Amaryllis striata in one of its forms bloomed here last year—3 years from seeds. I was very pleased with it. Some pollen saved from *A. pardina* gave a good pod of seeds and about a dozen seedlings are growing well now.

Amaryllis aglaiae from Dr. Traub had a short growing season this year, and has been dormant for the last month. As the weather is getting quite cool now, I do not expect it to put up more leaves. With a long rest, it may flower in the spring.

Amaryllis sp. (unidentified) from Dr. Traub in 1961, originally collected in Minas Gerais, Brasil, is very intriguing. It has beautiful blue-green foliage and is quite winter dormant. It has grown quite satisfactorily here and winters well in the ground.

Two other unidentified species are from Brasil. One labeled "?aulica" is quite different from my first species of this name. It has grown rapidly and should flower by 1964. The second was collected in the Campos do Jordao (Serre da Mantiqueira, alt. 1000 m.) is said to be deep red. The plant somewhat resembles *A. calyptrata* but is a much better grower and does not go dormant. It seems to have many more leaves at a time than most *Amaryllis.* I am hoping for flowers next season as it is quite large. Perhaps I will have to wait until 1964.

Amaryllis reticulata var. *striatifolia* has been grown in Australia for many years. I have only flowered it once (autumn 1960) and a plant of *A.* x *johnsonii* was in flower at the same time. Now seedlings of this

cross with a reduced white stripe in their leaves are large enough to flower but have not as yet done so. From the same flowering I also got a few seedlings from selfing var. *striatifolia*.

Amaryllis moreliana, seeds from the U. S. A. recently received, has germinated well. The seedlings are growing vigorously.

I have a couple of other unidentified species from Brasil, but until they flower I cannot report on them.

Amaryllis immaculata was imported as a mature bulb and has made good foliage this year and has now gone dormant.

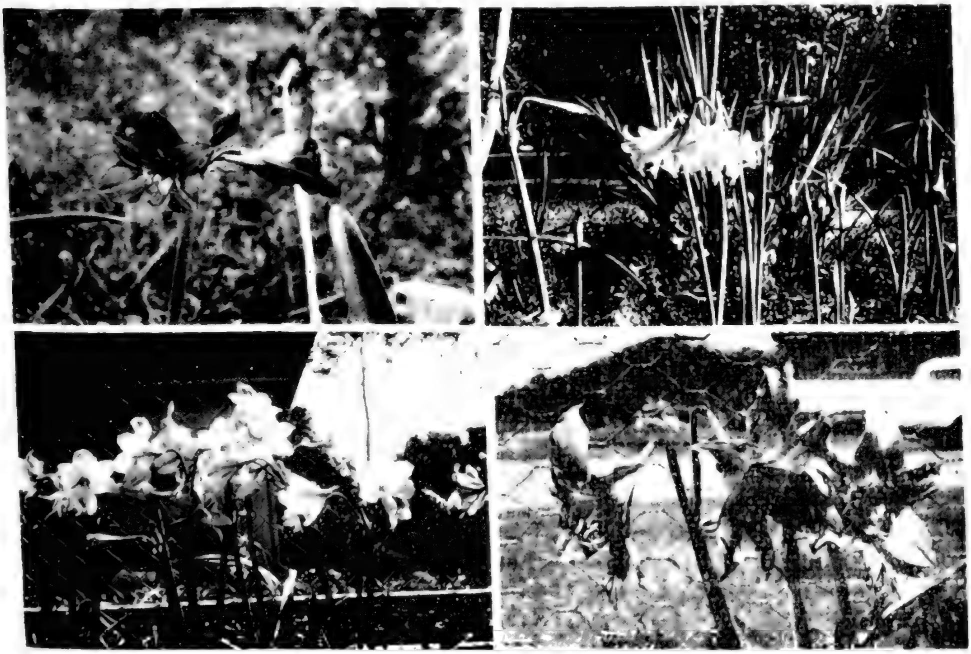

Fig. 21. *Amaryllis* collected by William Morris in northern Queensland gardens. Upper left, beautiful small red form, umbels 5-fld, greenish-white star in throat, and regular, wide-open perigone. Upper right, *Amaryllis vittata* (?), see text. Lower left, small, almost white form, resembles the form shown in upper left in shape. Lower right, apparently *Amaryllis belladonna* var. *major*, a beautiful scarlet (orange red), speckled with gold dust, and with a yellowish throat.

Amaryllis ambigua, also imported as a mature bulb, has grown well and is now dormant.

Amaryllis elegans (syn. *A. solandriflora*) from Caracas, Venezuela. Seeds germinated well and seedlings are growing vigorously, and so far has not gone dormant in winter.

It now remains to mention some of the bulbs which I collected in northern Queensland in October 1962.

The first appears to be *Amaryllis belladonna* L. var. *major* (see Fig. 21). It is a beautiful scarlet (orange red), speckled with gold dust, and with a yellowish throat. This was not uncommon in the gardens

from Townsville to Cairns. However, the most common *Amaryllis* was a beautiful small red form ($3\frac{1}{2}''$ across) with about 5 flowers per umbel (see Fig. 21). It has a clear greenish-white star in the throat, and a regular, wide open perigone. It is unlike any other *Amaryllis* I have seen.

The one that thrilled me most may be a small form of *Amaryllis vittata* (see Fig. 21). It has a very long tepaltube, about 6″ long, flaring at the apex to about 3″ across. It has semi-pendulous flowers about 4 to each umbel. From a distance, the effect is a pale pink trumpet but from close up it is white with a few reddish lines on the tepalsegs.

In Innisfail, I saw a garden full of a beautiful, small, almost white *Amaryllis*. In shape it resembles the red one mentioned earlier, but is white with only a few fine reddish lines on it. Again it is only about $3\frac{1}{2}''$ across the face. (See Fig. 21).

The last of these old and established bulbs was found in Gympie. To me it looked like an almost white variety of *A.* x *johnsonii*. It had somewhat more marked red lines on it than the others, but still gave the appearance of an almost white flower—about 4″ across the face. I obtained bulbs of all of these except the one at Innisfail, but I hope to get bulbs of it also this year.

Early hybrid? I sent Dr. Traub a bulb of this unidentified hybrid (?) which is very widespread in Australia. He has flowered it and believes that it is an early hybrid with *Amaryllis striata* in its parentage. The other parentage is of course unknown. In occasional gardens it is to be seen in profusion. It rather resembles *A. striata* but has a pale orange-pink flower on a scape up to 3 ft. tall, and has up to 8 flowers to the umbel. It has been consistently sterile here and no results have been obtained with its pollen on other *Amaryllis*.

Within the last month or two some interesting bulbs have been released from quarantine to me. These include 3 clones of *A.* Senorita Hybrids, *A. forgetii*, *A.* x *mostertii*, and a small bulb of *A. evansiae* x *A. aglaiae*. I will be awaiting results with these with great interest.

On top of these species, I have about twenty primary hybrids involving 8 different species. I will not bother listing and discussing these as not much can be predicted about them and I must wait their flowering. Most of them are very vigorous and I hope it will not be too many years until they flower. I have high hopes that from this genetic pool a nice selection of types of hybrids can be obtained. Perhaps in a few years I can give you some progress reports.

Our climate here seems very favorable for growing *Amaryllis*—species and hybrids—in the open ground. Rainfall is adequate although sometimes erratic and our water supply seems to be close enough to neutral and soft enough so that they grow well. Absence of extreme heat or cold means that most bulbs have a long growing season and as I mentioned earlier seedlings often grow the whole year round, winter only slowing their growth but not defoliating them.

As there are still quite a few species I would like to have, I would be pleased to hear from any other growers who would like to exchange bulbs or seeds.

[Editorial note.—With further reference to the unidentified hybrid *Amaryllis* with an umbel of 7 flowers, Fig. 16, Plant Life 1950 (pp. 99—100) should be noted. Here a similar hybrid is illustrated. It was grown by a friend of the late Major Pam in England in 1941. Major Pam also wrote to the writer about this hybrid and indicated that it was an old one dating back to the first half of the 19th century. Such a hybrid could have been carried from England to Australia by immigrants in the 19th century.—*Hamilton P. Traub*]

FLOWERING AMARYLLIS EVANSIAE

BURR CLOUETTE, *California*

Last October (1962), I received three small seedling bulbs of *Amaryllis evansiae* from Claude Davis in exchange for *Amaryllis calyptrata* seedlings. The largest of these flowered on Sept. 10, 1963 (see Fig. 22).

Fig. 22. Left, *Amaryllis evansiae* forma *flavescens* as flowered by Burr Clouette at San Diego, Calif. Right, seedling of *Worsleya rayneri*.

At the time of flowering, this bulb was about 1$^3/_8$ inches in diameter, growing in a 4″ clay pot, and planted in Black Magic planter mix. The three bulbs had spent the winter under Gro-Lux lights in the house in small pots. About the first of May, I repotted all three, the largest about 1″ in diameter, was planted in a shallow 4″ pot, with bulb about 1/3 above the soil. The other two smaller ones were both planted in one 4″ pot.

The largest bulb was put outside in full sun in front of the south-facing wall. The other two were returned to the south window in the house.

The bud was first noted on August 25th, and developed rapidly to open its first flower on Sept. 10. Just prior to opening, the two flower buds were 2 inches long, a brilliant yellowish-green Munsell hue 2.5G Y9/8. On opening, the flower was brilliant greenish yellow (7.5 Y9/8) with darker throat (2.5G Y8/9). The tips of the tepalsegs soon became flushed with a light pinkish orange. As the flower aged, this color spread towards the center of the flower, but only about two-thirds of the way, and the mid-stripe of the tepalsegs remained clear greenish-yellow. A very lovely and dainty flower!

The scape was 10 inches tall and carried two florets both open at the same time, and nearly at right angles to each other. The flowers were two inches deep and three inches across. The tepalsegs were somewhat wavy along the edges and reflexed at the tips.

I used some pollen saved from *Amaryllis* "Gracilis Hybrids" and another miniature on one bloom and pollen of 'Winter Carnival', 'Picotee' and a white Peruvian species on the other. The only *Amaryllis* I had in bloom was a white-striped red and *evansiae* was crossed on it.

One of the Senorita Hybrids is about to bloom so I will try some of the *evansiae* pollen on it. This is a back cross and should produce miniature pastels; maybe even yellowish ones.

GROWING AMARYLLIS IN POTS

C. J. Crochet and Mrs. J. S. Barry, *Rt. 1, Prairieville, Louisiana*

Perhaps one of the most challenging aspects of *Amaryllis* growing is successful pot culture. For a number of years these writers have made an endeavor to successfully bloom *Amaryllis* year after year by keeping the bulbs potted.

First, the proper kind of potting soil must be considered. Various kinds of potting soils must be tried before it can be determined that only one is superior to all others for any particular area. In a score of years we have found through trial and error that: (1) the potting medium must be basically organic in nature (2) that the proper pot size must be considered for each bulb (3) that fertilization must take place regularly during the growing season and (4) that the moisture content must be kept constant.

Potting soil formulae vary. We have concluded that for south Louisiana the mixture components best suited for potted bulbs are 2 parts leaf mold, 2 parts rotted cow dung, and 1½ parts coarse (builder's grade) sand to which a heaping tablespoonful bone meal has been added. This mixture is thoroughly blended at potting time and the bulb is planted so that half will protrude from the surface of the potting mixture. The mixture level is kept one inch from the top of the pot by tapping the pot downward. This leaves space for watering.

Pot size is determined by the size of the bulb which it will hold. One inch from bulb to pot side is considered best. Red clay pots are used. Using too large a pot is not advisable because many named *Amaryllis* clones by nature have weak, small root systems which never penetrate to the bottom of the pot and therefore leave the bulb loose in the pot. Cases in point are several white flowered sorts which have thin and short root systems. Some are 'White Giant', 'Maria Goretti', and 'Albino.' Generally, white flowered amaryllis require shallow pots.

Fertilizer requirements are more than that needed for bed grown *Amaryllis*. Frequent fertilization is a prime consideration. A long lasting fertilizer is applied each month during the growing season. One-half teaspoonful "Fertiloam" is sprinkled dry around the inside rim of each pot and watered in. In addition, a diluted application of "Ra-Pid-Gro" is sprinkled on the leaf surfaces at two week intervals by using a watering can. We in the south are fortunate in that we can take our potted *Amaryllis* out of the greenhouse during the season of rapid leaf growth. We have had very favorable results with growing *Amaryllis* in part shade under trees. Pots are placed close together and sugar cane waste is packed around the pots up to the rim.

The sugar cane waste serves two purposes. One is that the potting mixture surface is kept cool during the hot summer months and more important is that the moisture content is kept constant so that periods of over watering and others of drying out are kept at a minimum.

At the end of the growing season, potted bulbs are returned to the greenhouse for the cold months.

The ultimate in pot growing has not been reached, but it is only through ceaseless experimentation that better procedures are learned, and it is only with these improvements that proximity toward perfection in flowering potted *Amaryllis* can be achieved.

GROWING AMARYLLIDS IN NORTH GEORGIA

BECKWITH D. SMITH, *3479 Rockhaven Circle, N. E. Atlanta 24, Georgia*

My best *Amaryllis* are kept growing in the greenhouse all year. By handling them so, it is my belief they suffer less from wind and weather damage, traffic and from insects. Foliage growth is much better and leaves sometimes exceed thirty-six inches. Humidity is better balanced for growing, and proper watering and feeding can be almost perfectly controlled. A light shading of cloth over the greenhouse roof gives proper diffusion of the sun's rays and prevents sunspot, scald and burning of the leaves.

In the fall of 1962 I received a shipment of A. C. Buller hybrid *Amaryllis* from Cape Town, South Africa, which had been shipped by ocean vessel under refrigeration, and on receipt they were again placed under refrigeration at between forty and forty-five degrees until I could arrange to pot and place them in the greenhouse. After refrigeration for a week, the bulbs were potted, labeled as to color grouping and

placed in the greenhouse under an average temperature of 70 degrees. Most of these bulbs were very anxious to bloom. In fact, many of them were showing bud tips on receipt, and they continued to grow, slowly,

Fig. 23. Clones from the late A. C. Buller's Hybrid *Amaryllis:* bloomed April, 1963 by Beckwith D. Smith of Atlanta, Georgia. Upper left, color—orange red; upper right, color—watermelon red, suffused white, lower left, color—fuchsia pink, with white star; and lower right, color—wine red. Photos by Beckwith D. Smith.

even under the cold conditions of storage. Some of the bulbs began to flower in four weeks, but some of them took a little longer, and flowered in six weeks. This period of bloom was in October, and I was

informed that the bulbs had been dug at the Cape, South Africa, in July, just prior to their normal blooming season, approximately August and September. The blooming season for *Amaryllis* in South Africa is the reverse of our blooming season in the southern United States.

The bulbs produced flowers of entirely different colors and combinations of color than are available from the Holland growers. Some are self (solid colors) in shades of very dark red, scarlet, wine, salmon, rose pink, white, striped, and a new combination of color that can only be described as "suffused"; that is, the basic color is rose, let us say, and throughout the bloom there is a suffusion of a lighter color, and with numerous ones showing a white blush. These flowers equally match and in my opinion, exceed the standards of European *Amaryllis*. My observation is, also, that the Buller *Amaryllis* have many other advantages, one of which is the heavy substance of the tepalsegs, making for a longer bloom period, certainly most desirable. Mr. Buller concentrated on this one feature, and he succeeded in developing superior hybrids without sacrificing any part of the beauty of his hybrid flowers. As each flower opened I tried to get good color pictures, and I have submitted these to Dr. Traub. (See Fig. 23.) Pollination was expected through several crosses of these October blooms, and seedlings are now in vigorous growth.

Similarly, in February of 1963, I potted up an additional selection of A. C. Buller bulbs for bloom and exhibition in the Atlanta Flower Show, held in conjunction with the Annual Convention of Federated Garden Clubs of the United States at Lenox Square, Atlanta, Georgia, on April 17-18, 1963, and at which time twenty-three potted Buller bulbs in bloom were exhibited for the first time in the United States. Delegates to the show numbered more than two thousand, from all parts of the United States, and all who saw the blooms were extravagant in their praise. Many of the ladies said that the *Amaryllis* exhibit was the focal part of the show.

After the close of the educational exhibit of Buller bulbs, the potted plants were brought back to my greenhouse and have continued to grow without let-up, and at the time this report is written (September 8, 1963), show no indication of losing their leaves or in any respect becoming deciduous. Apparently, this means that the Buller bulbs can be made to rapidly change their bloom habit, and become acclimatized for spring blooming normal in our southern states. On the other hand, if they are dug here (after being planted in outside ground space), possibly they could be brought into bloom during our fall season by digging and drying them in July, refrigerating for a short period to induce dormancy, and then potting up for indoor fall blooming. I believe it is worth a try, and I will follow this line of experimentation during the coming months. I would be very glad to have correspondence with any members of our Society as to their successes in growing the beautiful A. C. Buller hybrid *Amaryllis*.

WINTERING AMARYLLIS IN THE NEW ORLEANS AREA

W. J. Perrin, *4753 Press Drive, New Orleans 26, Louisiana*

This is a follow-up article on "*Wintering Amaryllis in the New Orleans Area*", appearing in 1963 Amaryllis Year Book, page 110. Our 1962-63 winter did not have the low temperature experienced in January

Fig. 24. Perrin hybrid Amaryllis (upper and lower) during summer of 1963 outdoors, New Orleans, La. These bulbs had been stored indoors during the previous winter. Photos by W. J. Perrin.

of 1962; however it did have a record number of freezes. In other words, the severity was lower and the frequency was higher. All during these some 12 to 15 freezes the writer had no worries about the effects of the weather on his bulbs. As mentioned in the '63 article, all of my bulbs were dug on November 1st, disinfected and placed in boxes well packed with Perlite. During the winter months the beds were dug and given a 1-inch layer of 5-10-5 commercial fertilizer and covered with an approximate 3 inch layer of the same soil. During the latter part of February the beds were again dug (spaded) and on March 1st the bulbs were planted. The four months rest given the bulbs seemed to do them much good, in that they took off and grew vigorously

Fig. 25. Amaryllis 'Grand Mist' and 'Grand Bay' during summer of 1963 outdoors, New Orleans, La. These bulbs had been stored indoors during the previous winter. Photo by W. J. Perrin.

immediately. Bloom as expected, was a bit late and normal. This procedure is highly recommended as the rest does the bulbs good and above all, it eliminates worry of loss of bulbs by freeze. Two important facts must be remembered:

1. After packing and storing the bulbs, don't forget to place the boxes in a location free from freezing temperatures; 35 to 50 degree temperature range is satisfactory.

2. Amaryllis bulbs, when purchased or dug, should be soaked in a fungicide solution for 20 minutes and let drain before storing or planting. ORTHOCIDE FUNGICIDE containing 50% captan, works very well.

Please note Fig. 24. Here we see bulbs as of August 20th, 1963 during summer growth. These bulbs were all stored during winter months and are progressing normally as of this date. Of interest is Fig. 25. Here we see the two named and registered bulbs, 'Grand Mist' and 'Grand Bay' during the growing season. In all there are about 47 plants. This is especially interesting to the hobbiest for here we experience multiplication of one's own product.

COMMENTS ON HYBRID AMARYLLIS

Burr Clouette, *California*

The clone 'La Forest Morton' bloomed well and was very beautiful—two scapes, each with four flowers. A white, unnamed clone, from Cecil Houdyshel blooms every now and then—four times last year; three times so far in 1963. It has three nice slightly greenish white flowers per scape. The flowers are about 7-inches across the face, and fairly flat. This bulb is grown outdoors in a pot, and bloomed at Christmas time last year. At that Season of the year in 1962, I had this white, a prepared 'Camellia' and 'Giant Goliath' in bloom, and three Hadece bulbs in bud and showng color. They were all in bloom by New Years.

'Winter Carnival' and 'Marion', two new whites, performed well—the latter has some fine reddish pencilings in the throat.

'Red Master' produced three scapes, each with two huge dark red flowers. 'Royal Velvet', with flowers not quite as large, produced three and four flowers on two separate scapes. The bulb was much smaller, only about two inches in diameter, whereas the bulb of 'Red Master' was over three inches in diameter.

Late in the season, a clone I have been growing under the name, 'Orange Queen' produced two four-flowered scapes, with florets 8-inches across the face, flat, orange with darker throat.

'Clown' is a good red and white striped clone, and was the last to bloom in the regular spring season.

One of Mrs. Barry's *A.* x *johnsonii* x 'Ludwigs Goliath' is a very nice medium red—four flowers, about 7-inches diameter, on each of two scapes.

One of my own seedlings (Mead Reginae Division x Dutch) is now producing its third scape. It is slightly brownish-medium red; 3 or 4 six-inch flowers per scape, and quite trumpet-shaped.

As I write this report (August 15, 1963), 'Camellia' which bloomed at Christmas time is producing a second scape; as is also 'Tangerine', a fine Hadeco clone which produced two scapes last New Years. The Hadeco clone 'Rosaline' has just produced its third scape.

I was disappointed in the clone 'Pallas' which was substituted for 'Volendan'. It bloomed well, 4-upturned, medium sized flowers on each of two scapes, but was just an orange red with white throat. I do not like the upturned flowers.

THE FASCINATING ZEPHYRANTHEAE

ALEK KORSAKOFF, *2975 Shipping Avenue, Miami, Florida 33133*

All my life I have loved plants and their flowers. My happiest hours were spent in parks, botanical gardens (plantariums), woods, fields and forests. Recently my interest has shifted to the really miniature things that can be grown in small pots.

Since 1957, when Mrs. Clint sent me a goodly collection of *Zephyrantheae*, I have been enamored with the Rain Lilies—or Zephyr Lilies, or Fairy Lilies. I am captivated by the diversity of flower form, from tubular to rather flattish when fully open. Colors range from purest white, shading through pinks and rose into dark red; all shades of yellow, ranging into shades of orange, and to cardinal red; pastels in various shades; some bicolors, and even tricolors; some with white, green or burgundy red throats. Sizes of the flowers range from one-inch to five inches across the face when fully open, and with tepalsegs ⅛-inch to more than one inch in width.

What a difference there is in foliage! Starting from almost hair-line strings (filiform), the leaves range to 1-inch or slightly more in width; in length they range from a few inches to 18 or 20 inches or more in length; with coloring ranging from the dullest grayish to the brightest varnished yellowish or dark greens.

In hybridizing one is fascinated by the great uncertainty of the results. One finds that some are self-sterile and unresponsive to the pollen from other species. Others cross and ripen seeds that never germinate. Many, far too many, cross and produce seeds so profusely, but the seedlings are replicas of the mother plant. Thus apomixis is so prevalent that one never knows what one should get from a particular crossing.

When one gets a real hybrid, one is cheered with the thought that he has proven compatibility of two species, or genera, knowledge useful to science in general. During the six years that I have been working with the *Zephyrantheae*, only one cross yielded a hybrid that merited naming in my opinion.

Discouraging? Oh no! When one sees dozens of bright faces smiling at him, swaying and dancing in the breeze—almost after every good shower—one smiles too. Give them up? Oh no! There is so much to do; so much to hope for; and such a good chance of producing something that will surely bring joy to many others. There is no chance whatever of giving up such a fascinating interest in life.

During the next few weeks every day I will be expecting the promised bulbs from the Dominican Republic—*Zephyranthes bifolia* Aublet—right from its home where it was first found in the year 1775. I am staying put!

EVOLUTION OF AN AMARYLLIS ENTHUSIAST

MRS. JOHN A. ETHERIDGE, *Florida*

Whoever thought twenty years ago when we bought our Florida home that the large bed of *Amaryllis* on the grounds would spark a hobby that has finally grown into a full-time occupation for two people! At the time, we were mostly impressed by the size of the property (two city lots 100 by 105 feet) and by the lovely oaks, citrus, hibiscus and other semi-tropical shrubs and vines. We arrived in the spring, however, the best blooming time for *Amaryllis*, and, after seeing these beautiful plants in bloom, we could hardly wait until the next spring to see them again.

As the years went by, I joined one of the garden circles and became interested in the flower shows. Some time later, the Federation Flower Show was held at a time when *Amaryllis* were at their best. I took First, Second, and Third in that show and, from then on, I was an enthusiastic grower of *Amaryllis*.

A kindly neighbor showed me how to plant the seed with the point down, making little grooves with a ruler or yardstick, depending on the size of container used. By 1957, with the help of a yard man, I had extended my collection to blooming-size 3,500 Mead hybrid bulbs. In those early days, no record was kept of the crosses; just waited for the surprises, which were very rewarding. Among the most outstanding color shades in the crosses were fuschia shades, some with light throats—others solid, and one plum shade, the most perfect *Amaryllis* I have ever seen! Out came the pollination booth and I waited for the second scape to appear. Heartbreak followed as it barely came through and then withered. I began soil testing and found the soil very acid. I had been advised over the years to use neutral copper and had used it so long that the ground had become toxic. Many of my special bulbs disappeared.

Space had run out in our garden but the desire for some Dutch *Amaryllis* plagued me. I thought I would get just a few, though where I would put them was a big problem. About this time, my husband joined me in my hobby as he was greatly impressed with them. Soon there were several hundred Dutch hybrids on hand so we farmed out most of the Mead hybrids to a daughter and a friend. Now we have on hand at all times about 3,500 of the Dutch hybrids and crosses. Where could we put all of these? It was then that my husband had a brain storm. Stooping, kneeling, and bending to keep weeds and wild grass out of the *Amaryllis* caused my husband to wonder if there wasn't a better way to care for the plants. We had not yet learned about mulching. It seemed that if some way could be found to *raise* the beds to a no-stooping level, care would be much easier. Why not tables? Acting on this impulse, my husband built two tables as an experiment. The tables were 28 inches high with 1" by 6" treated lumber for the frames and hardware cloth for the bottoms. The tables were very successful, easing the strain on back and knees. The next

year we built ten more tables. The tables were placed in a single row and a shade shelter was constructed of 6 foot poultry wire covered with Spanish Moss. The moss gives filtered shade.

We now have about forty tables, 2′ by 4′ in size. About the only change we have made is to use 1″ by 8″ boards instead of the 1″ by 6″, thus giving greater depth to the bed. With full-sized, mature bulbs we plant 18 to each table, with three rows, six bulbs to the row. Smaller size bulbs can be planted more closely. Fertilizing, spraying and mulching are easier. We have also, most of the time, 100 or more potted plants. These are also placed in the tables and spaces between the pots are packed with mulch to conserve moisture.

The table method gives us the opportunity to use a uniform soil mix and to watch closely the pH. We have found that *Amaryllis* do their best when the pH is about 6¾. Less than 6½ may cause acid decline. For our soil mix, we use ¼ garden soil, ¼ compost, ¼ well-rotted manure and ¼ sand or Perlite for aeration, plus bonemeal. This mixture has worked very successfully.

Some of our Texas friends claim that our table method is a lazy man's way to grow *Amaryllis*, but my! what a relief not to have to do all that stooping. There is still plenty of work to do. Besides keeping a check on the soil and spraying regularly, we have to watch for insects. About the only insects that bother *Amaryllis* are the lubbar grasshopper, which is controlled by spraying or by using a pair of clippers to snip the villain in two; slugs and snails, which are controlled by bait.

In spite of our table method, we still keep four ground beds in which we have McCann doubles, whites doubles, whites with a faint line of pink, some old Mead favorites and Seminole Reds. We use commercial fertilizers which are high in phosphorus and potash, low in nitrogen, with minor elements. Seedlings are given liquid fertilizer and all sizes are given some as during the rainy summer season so much is leached out.

Each year we import bulbs from the best growers in Holland and advertise them nationally in three magazines. From the small beginning with one bed of Meads, we have come to the place where we live and breath *Amaryllis* all year long.—*6908 Narin Ave., Tampa, Florida, 33604.*

EFFECT OF DECEMBER 1962 FREEZE ON FLORIDA AMARYLLIS

MRS. FRED TEBBEN, *P. O. Box 281, Lake Hamilton, Florida*

In the 1963 Amaryllis Year Book, I reported on my Amaryllis moved from Illinois to Florida in 1961. This article was to be a report on the progress made in growth of all bulbs here in my Florida garden, but the worst freeze of the century came to Florida in December, 1962, so my report will really be on its effect on all amaryllis here. For three days and nights we had such extremely low temperatures it was

feared little would be left growing. Here the thermometer registered 18 degrees for long periods of time, and even much lower in the low sections outside town. We are on one of the highest spots in Central Florida and so were fortunate. Then, too, the cold came from the northwest and had to pass over much warm land area to reach us so we did not suffer as much damage as had been feared at first. Almost all signs of that severe freeze are now gone, altho much tropical planting has had to be replaced with hardier material.

I have two large Amaryllis beds, each partially shaded and each partially protected from the north winds. In one bed are all my Dutch bulbs and African ones, while in the other are my seedling bulbs and those from India and Japan. I watched these most anxiously for I had nothing with which to cover or mulch either bed, and I was much surprised to find that very little of the Amaryllis foliage suffered much damage. Some of the Dutch bulb foliage immediately showed red spots as a result of the cold damage, but very little showed up on the seedling bed. The "native" *A. rutila fulgida* bulbs, however, lost all their leaves and as a result began to put up buds early in January. More cold came and as a result these buds either blighted or bloomed in very deformed and crooked shapes. The Dutch bulbs also sent up bud stalks early and many of these blighted, but some came later and were really lovely and much appreciated since I had feared I would lose all of them. Those that did best were protected from the extremely cold northwest wind, so I shall try to give more protection from such winds in the future. In the seedling bed which is more exposed no foliage was frozen and almost none showed red spots from the cold, but not a single bud appeared, and I now find that the bulbs are all showing offsets. In many cases there are now four bulbs where I planted only one, so I am afraid I shall again have little bloom from these bulbs.

The *Crinum* foliage was all frozen down entirely, and many people dug and discarded their bulbs because of this. I salvaged a few so now I shall have more to identify later. All have sent up fine foliage and *Crinum* 'Cecil Houdyshel' and the "Milk and Wine" lilies have bloomed very well; so has *Crinodonna corsii* clone 'Fred Howard.' It bloomed in April and is again showing bud stalks, so even tho all foliage was frozen, these have all come back beautifully and all will bloom eventually. *Habranthus* and *Zephyranthes* were beautiful as always, and the paper white narcissi and the daylilies have outdone themselves with bloom this year. So, all in all, little damage was done to the amaryllids grown here, and I hope we shall never again experience such a freeze in this section.

I have acquired a few more Amaryllis bulbs, of course. I have been much pleased with the beds of the Mead hybrids that bloom so beautifully over a long period here, and the variety of colors one finds among them. Then, too, I purchased some small 22/24 centimeter bulbs of the clones of the Dutch hybrids that seem to do best in the borders here in the south. Among these were 'Apple Blossom,' 'Love's Desire,' 'Ludwig Dazzler,' 'Marie Goretti,' 'Margaret Truman,' and others.

Even tho these were small bulbs all of them bloomed and all have grown enormously in the border. I was very pleased with these small sized bulbs and believe I shall add more of this size as time goes on.

We are told here that the *Amaryllis* need little but water to make them grow and bloom very well. Chemical fertilizers leach away quickly and do little good so I am adding humus in the form of compost etc., to hold the moisture and add food value. This year I seem not to have many of the huge lubber grasshoppers and only a few cutworms to fight, so I am making progress.

Before my last *Amaryllis* bud had opened, my husband and I took off on a two weeks' trip through the Smokies and on up to Washington, D. C. to visit our son. All the way up I enjoyed the Mead hybrids and native amaryllids blooming in Florida; and through Georgia and the Carolinas, the iris, daylilies and peonies were gorgeous. In the Smokies the dogwood was at its very best, and in Washington the azaleas and rhododendron were lovely. On our return trip we stopped in Charleston, South Carolina, for a few days and there I saw lovely beds of *Amaryllis* in bloom in mid-May. Many of these were the species bulbs, but most were the hardy Mead hybrids. I inquired about them, and was told that the temperature reached nine degrees there in Charleston, but the *Amaryllis* suffered no damage as they are planted deeply enough so that they do not come up until all danger of cold weather has passed.

All in all, I cannot complain of the season, and can only hope for more bloom another year. The blooming season seems to be somewhat more extended than one at first realized, as only last week I saw a lovely red *Amaryllis* in bloom on the north side of a house not far away. This may be unusual, but the crinums come when the *Amaryllis* are done, and the *Habranthus* are indeed "surprise lilies" and are still blooming now and then along the edge of the *Amaryllis* bed. I have many more seedlings to plant out this fall, so will have to extend my *Amaryllis* beds to take them in. To me a bulb is a "surprise package," and I can never seem to have enough of them. They have bloomed this year from mid-February till mid-July and may go on longer but since I shall soon go back to Illinois for a visit I suppose I shall miss seeing them. Thus far I have made no crosses or tried any hybridization of my own. The seedlings I have to set out next fall are pure Dutch, or Dutch x Mead crosses made by other people.

LANDSCAPING WITH AMARYLLIS

MRS. BOB E. HEROLD, *203 Cromwell Dr., San Antonio, Texas 78228*

As most Texas gardeners begin *Amaryllis* growing with *A.* x *johnsonii;* I, too, began my interest with ramets of this clone. My garden was begun in earnest in June, 1949, with the building of a new home; however, I've gardened all over Texas for over thirty years. As my garden progressed, transplanting occurred in various beds for more pleasing harmony.

My next *Amaryllis* was a very prolific variety, and to date, I have not been able to identify it. It seems to be a reverse of *A.* x *johnsonii*—small, trumpet-shaped, white with rose-red stripes, fragrant, two to three scapes with four to six florets to the scape and a good multiplier. I have grown this for about twenty years, the "start" coming originally from California. I have exchanged and given it to many people trying to find out about it. Also, I have sent bulbs to Mrs. Cecil Houdyshel, California; Mr. Claude W. Davis, Louisiana and more recently to Mrs. A. C. Pichard of Houston. These are interplanted along a winding sidewalk bed which presents a profusion of color in early spring from bulbs, early perennials and bearded Iris.

Along a driveway, a bed of pink roses is planted each year with pink *Ranunculus*, shades of double pink St. Brigid anemones and pink tulips, interspersed with pink Rain Lilies and one hundred and eighty-five pink and white "Califlora hybrid" American unnamed *Amaryllis.* These were gained from an original purchase of one dozen mixed "Califlora hybrids" bought in 1952. This one *Amaryllis* has increased in such prolific numbers that I now have two hundred and twenty-five of this one color variety, besides what I have given away. In front of these *Amaryllis*, a border of the common pink oxalis add their beauty nine months of the year.

Across the front of the house, a brick planter has thirty of the pink and white striped "Califlora hybrids" and in the springtime has a row of "White Magic" petunias bordering these.

In front of the shrubbery planting are more *Amaryllis.* Heretofore, they have been mixed reds of the "Califlora hybrids", but these have been moved to a back garden bed and this spring will see a continuation of the small pink and white trumpets, already mentioned.

We have a corner lot and the street side has an attractive, old and ornate antique white-painted ornamental iron fence set in concrete, the concrete covered with various small leaved varieties of ivies. Inside this fence, is a choice new bed of Ludwig seedlings. From the one hundred seeds, I have sixty bulbs. I had the best luck with the dark reds, twenty-one out of twenty-five seeds; fifteen out of twenty-five in the crimson; fifteen out of twenty-five in the pinks, and only nine out of twenty-five in the whites. In this bed, are a number of choice "selfs" from unnamed Ludwig seedlings, before I knew anything about hybridizing. I also have three "Picotee" seedlings. This bed will be bordered with white "Little Gem" Sweet Alyssum. This bed will be watched to see what I have.

In back of a new garage are two new beds, one with one hundred and eleven "Self" seedlings of 'Nivalis' and 'Maria Goretti'. It has been bordered with the green and yellow *Alternanthera.* The other bed includes my choice named clones and other unnamed Ludwig and Warmerhoven bulbs. In this bed are 'Sweet Seventeen' and five offsets in three years; 'Bouquet' (my favorite), 'Halley', 'Maria Goretti', 'Nivalis', 'Ludwig's Scarlet', 'Doris Lilian', 'Pink Favorite', *Amaryllis striata*, var. *fulgida*, and *rutila*, as well as many unnamed American

hybrids. This bed has been bordered with the red and yellow *Alternanthera*.

Across the lawn, the side and back cyclone fences are entirely covered with nine varieties of ivies, and here are many more American and Dutch seedlings and offsets, including one hundred and four of 'Bouquet' "self" seedlings. All of the back garden beds are in graceful curves edged with red bricks (at ground level) and "monkey grass". Although monkey grass can be a nuisance, with attention, it makes a neat appearing border in the cold of winter when gardening comes to a "slow walk".

Even my alley is landscaped with *Amaryllis*, about fifty; with a restful background of the ivy. In all, I have seven hundred and ten *Amaryllis* in blooming size with three hundred and fifty one-to-two year old seedlings to look forward to in enthusiastic anticipation. I grow many other amaryllids. This fall, I will purchase four named *Amaryllis* clones and several species.

Since I go for bulbs, people say they never pass without seeing color and beauty as well as a good general appearance; all of which is cared for by my husband and myself.

THE 1962-63 AMARYLLIS SEASON

ROBERT D. GOEDERT, *P. O. Box 6534, Jacksonville 5, Florida*

The 1962-63 season like the two previous seasons was very cold. Many *Amaryllis* planted in the border in the south, possibly weakened by the past two seasons, rotted during the winter and were lost. A number of people complained that they lost their entire collection of Dutch *Amaryllis*. This was particularly evident in the Valdosta, Georgia area where few Dutch *Amaryllis* were entered at the show. The Mead hybrids in the Valdosta area appeared to have fared better. Whether this indicates that the Dutch hybrids are less hardy than the Mead hybrids is not fully evident. First there are many Mead hybrids planted in the yards that gets little or no care and if a bulb or so is lost no one particularly notices it. When a person has a few Dutch *Amaryllis* he gives them a great deal more attention. This includes additional fertilizer and it is the writer's opinion that the Dutch *Amaryllis* being given special care are more fleshy and not hardened off as they should be at the end of the season. This tends to cause many people to think the Dutch *Amaryllis* can not stand as much cold as the Mead hybrids. It has been my experience that the Dutch *Amaryllis*, if treated like the Mead hybrids, are possibly just as hardy. I do feel that those who grow their Dutch *Amaryllis* in the border need to give them a little more potash in the fall to harden them off before winter sets in. Planting in a well drained area will also help and some sort of mulch over them in winter would also be helpful.

Not only did those who planted in the border lose bulbs but many who planted in pots reported great losses. In most cases they attributed this to carelessness. Some said they had heard the weather forecast but just did not take it too seriously. You might say they figured lightning does not strike the same place three times. Many said they went out the

next morning too late and found their bulbs completely frozen. Some placed their potted plants in their garages or other area only to find this did not provide adequate protection.

This all indicates that, in the future, bulbs in the border should be planted deeper, should be hardened off in the fall and given a little special protection. Those with potted plants will have to learn that they should provide a little heat in their storage areas during extremely cold weather.

The *Amaryllis* bulb crop from Holland and other areas was not as good in quality as normal this past season. Some of the white clones as well as picotee types showed that due possibly to a sudden dip in temperature the bulbs had made spikes in the greenhouse during late summer or fall. Some bulbs showed advance buds which decayed during shipment. This reduced the number of spikes some clones produced. The Hadeco South African clones, on the other hand, produced an exceptional number with three spikes. The South African *Amaryllis* are becoming more popular and with the introduction of named clones should be more evident at shows. The *Amaryllis* bulbs from India this past season also were not up to quality and many did not flower; however the quality of the flowers appears to improve each year. It is expected that the percentage of spikes from the Indian bulbs will be better in the future as they are beginning to rotate their crops to new ground each year. They also are trying to market the bulbs as soon as they reach maturity. They find that once a field reaches maturity the bulbs will decline if not lifted and planted in new soil.

This past season more people purchased the smaller size Dutch bulbs. Besides the fact that two of these can be purchased for the price of one large bulb many find they are much more successful with them. The young bulbs are usually more vigorous. They make a fair spike the first year and if fertilized properly will grow into a top size bulb for the second season. Many find the second year with a good root system established in a pot they can get an exhibition bloom much easier than with a newly imported large bulb. Of course there are still a number of experienced exhibitors who prefer to buy the large bulbs for exhibition. A really experienced grower can flower a large bulb very successfully the first year and keep the bulb in a flowering condition for many years. The inexperienced grower however finds the older bulbs harder to handle as they tend to remain dormant over longer periods whereas the young bulbs tend to start easier and establish themselves better. The small bulbs once established are easier to maintain. The small size bulbs are also becoming very popular in Italy and southern France as well as in the southern United States. Many northern hobbiests prefer the smaller bulbs. They are not as successful with the larger bulbs as they decline after flowering the first year. The small bulb will establish itself at the proper size for pot culture and can be maintained in a healthy condition that will make a reasonable flower spike or two each year without forcing. They feel that bulbs that are overgrown can not be maintained under pot culture conditions and have to decline. Those who grow for exhibition should understand that when a bulb is forced

to get a maximum flower, most clones can not recover in one year's growth and they should not depend on exhibition spikes from the same bulbs year after year. They should have a program whereby they have new or young bulbs coming along each year.

While the large exhibition varieties in solid colors are still most popular there is some indication that other types will be seen more in the future. First in the large exhibition types there are trends away from the solid colors and the classic flat round leopoldi types. Ludwig's Picotee types have an airy form. They are a departure from the solid whites. Although for years there have been many white seedlings with a touch of red or pink in them. Few or none had been introduced. The past few seasons we have seen such clones as 'Marion', 'Peppermint', and 'Siren of Paradise' introduced. These are all beautiful white clones with just a fleck or pencil stripe of red. This gives them some individuality not associated with the pure whites. Ludwig's new introduction, 'Streaking Stripes', indicates a new departure in hybridizing. Here-to-fore a clone with any green in its makeup was considered inferior. 'Streaking Stripes' has a great deal of green in it. It is however an exceptionally nice clone. The blending of red and white with green is very pleasing. It also has a very elegant and beautiful loose form. It probably will become a leading clone although a striped variety seldom ever is as popular as a solid color. The new blush or blended clones such as 'Golden Triumphator', 'Floriade' and 'Pink Beauty' are becoming very popular. All this in the large flowering hybrids is a welcome change from the Dutch breeding of the past where some 8 or 10 solid color tones were all that were available and each new one was another in this limited color range.

In addition to the new bitones and blends being developed new colors are appearing. Ludwig's 'Home Decorator' is a new bronzy salmon that has wonderful color value. The Hadeco African *Amaryllis* also have many improved colors among them.

The small *Amaryllis* are each year becoming more popular with the housewife; however they are not widely accepted by the exhibitor. The gracilis forms can be grown several to a pot and give a show of flowers over a relatively long period of time. As these bulbs can be purchased more reasonably they will become popular and it is hoped their color range will be expanded. New types of free flowering medium size hybrids are needed in the trade. The large flowering hybrids do not flower reliably enough to get and keep the interest of the normal housewife. A free flowering small or medium flower variety is believed to be practical in breeding and once developed can become very popular with the housewife. In this respect it is hoped that some of the free flowering habits of *A. striata* and other species can be developed in new small or medium size hybrids.

The quality of flowers at the shows has declined the past several years. Part of this is a result of the extremely cold weather but part is due to the lack of interest by the exhibitors in purchasing new stock each year and retiring some older bulbs previously purchased that are declining.

Possibly the top show variety of the past season was 'Marion'. It grows large very easily and can compete successfully for the Best Flower in the show. In commenting on the clones I observed this past season I would like to again, as last season, comment by color groups.

WHITE CLONES

This past season saw several new white clones introduced. 'Ouverture' and 'Winter Carnival' are both tall new whites with airy form. Both seem to be excellent additions to the whites. Of the older clones 'Flying Cloud', 'White Giant', 'Christmas Gift', 'Nivalis', 'White Crane' and 'Dazzler' all gave a good account of themselves. Many still claim first place for 'Oasis'. Others have their own white favorite. 'Mt. Blanc' possibly was the most outstanding in my collection. Most of these made three (3) large spikes.

WHITE WITH COLOR

Picotee clones remain popular and the two new named clones, 'Square Dance' and 'Dutch Doll', were well received. The clone, 'Sensation', is just what the name implies. It is a real flat white with a ¾″ bright red border. It is without a doubt one of the most beautiful clones. 'Marion' is a huge white with some red penciling. It is a good show variety and will become very popular as it flowers easily.

WHITE FLUSHED

'Apple Blossom' still is the most popular *Amaryllis* and a most vigorous clone. 'Love's Desire' with still more pink in it is very good. 'Rose Marie', a new Van Meeuwen clone is very similar to 'Love's Desire'. 'Pink Beauty', white flushed pink, is gaining in popularity. 'Little Diamond' is still the undisputed leader of the pinks. Any one who sees it wants it. It appears solid pink at a distance and is round and very flat. The flower is rather large. 'Floriade' and 'Golden Triumphator' make very large flowers. One is white blush pink and the other white blushed golden orange.

WHITE STRIPED

'Streaking Stripes', Ludwig's new striped clone is very outstanding. It has a great deal of green in its makeup which adds handsomely to its beauty. It also has an exceptionally beautiful form. This is a striped clone I predict will become very popular. 'Zenith' still is popular with the exhibitors especially in Texas. 'Silver Lining' is popular in the Mobile area. Van Meeuwen's new variety, 'Pallas', is a white veined red clone rather than a stripe and is very interesting.

BICOLOR

'Beacon' is still popular. 'Candy Cane' flowered well this past season. 'Fantasy' and 'Royal Dutch' are popular rose and white varieties. 'Five Star General' appears to have propagation troubles. Van Meeuwen's new clone, 'Aphrodite', is somewhat similar to 'Five Star

General' and a welcome new addition to the bright red and white clones. 'Piquant' is a fine new clone similar to 'Candy Cane' but of a medium dark red coloring rather than orange red, it is a fine new addition.

BLENDS

Two new ones in this group were well received. 'Day Dream' is a fine new clone that might be classified as an improved 'Margaret Rose' or 'Sweet Seventeen'. Only time will tell. It is a fine clone with very large overlapping tepalsegs. 'Fair Lady', vermilion and white, with the make up as 'Margaret Rose' is a real beauty and really different. It is an excellent new one. 'Pinksterflower' is still popular in orange and white. 'Rosaline', a Hadeco clone, is brick rose and white. This is a new color and a most beautiful free flowering addition.

ROSE PINK

'Dutch Belle', a soft light rose pink is probably the most outstanding introduction in this color in a number of years. The backs of the tepalsegs are white which makes the flower appear lighter. 'Flora Queen', although very scarce, is a real beauty in a light rose with lavender caste. 'Queen of Sheba' still remains one of the leading rose pinks with lavender caste. It grows easily. 'Bellini' is a new medium rose pink that was well received. 'Shakespeare' (not Ludwig's and to be renamed) is a particular old rose color that is very outstanding. 'Fritz Kreisler', a new one similar to 'Daintiness', drew a great deal of comment and will be popular this coming season.

ROSE RED

'Bella Vista' is still possibly the best medium rose red. It is a real beauty and a very robust grower. 'Trixie', Ludwig's new rose red, is a good addition to this color. Warmenhoven's 'Mysterie', 'Moreno', and 'Bordeau' are all good dark rose reds.

WINE RED

'Red Master' still leads this list. 'Blazing Star', 'Tristan', 'Alcyone' and 'Purple Queen' all have their admirers.

DARK RED

'Mars', Van Meeuwen's new dark red was well received. This is a large flowering clone that should become very popular. 'Queen Superiora' and 'Franklin Roosevelt' remain popular.

MEDIUM RED

Warmenhoven's 'Flamboyant' was well received and is a beautiful red. It, with 'Red Champion', 'Topscore' and 'Apollo' make up a quartet that is hard to beat. All are beautiful large reds of different form and are most outstanding. 'Red Champion' is huge and can win easily at the shows. 'Scarlet Triumph', 'Ludwig's Scarlet' and 'Wyndham Hayward' remain popular.

Fig. 26. *Amaryllis aulica* var. *platypetala* as grown by Sam Caldwell, Nashville, Tenn., from a bulb imported by Robert D. Goedert, Jacksonville, Fla., from Hawaii where it is naturalized. The species came originally from Brasil. Photo by Sam Caldwell.

LIGHT RED

'Personality' is a rosy vermilion that has some yellow on the mid rib deep in the throat. It was well received last season and will increase in popularity this coming season. It is a very beautiful addition.

ORANGE RED

The Hadeco African 'Orangedale', 'Terro Cotta' and 'Tangerine' are all nice orange red clones. 'Tangerine' flowers well from 22 cm size bulbs. It will often make 3 spikes. The flowers are up to 6". It is an excellent pot plant. 'Traffic Stop', 'Lucifer', 'Don Camillo' and 'Cherokee' are all good orange reds.

ORANGE

'Delilah' is still one of the best orange clones. It has a clear self soft orange color. 'Orange Wonder' becomes more popular each year and is possibly the leader in this group. 'Camellia' flowers darker each year and can be classified in this group or as orange red. Propagation difficulties may cause this clone to be discontinued. 'Salmonette' still remains popular.

SALMON

'Home Decorator' is an outstanding new bronzy salmon that should become very popular as it is a new color that is most outstanding. 'Rilona', a buff or very light salmon is still sensational and a most beautiful clone. 'Bouquet' is still very popular. 'Queen's Page' and 'Salmonea' still perform well.

SPECIES

The species continue to be hard to obtain and usually result in a financial loss to the importer. I was able to get 14 different ones from the wilds this past year; twelve from Brazil and four from Peru along with several lots of *Zephyranthes and Habranthus.*

The most promising of these species is SA63-12 from Santa Catarina Island, Brazil. It is said to be yellow. The growth appears to be that of *A. striata* and is very robust. If this one turns out to be truly yellow it will be a worthy addition.

The species SA63-11, said to be a white *Amaryllis* apparently is a *Hymenocallis* or *Crinum.* The growth is similar to *Hymenocallis speciosa* but less lance leafed than the species obtained from Van Tubergen of Holland. It is also distinctly different from the *Hymenocallis* LM63-3 received from Iquitos, Peru this season which is an exceptionally broad leaf form of *Hymenocallis.*

Three wild species received this past season have flowered. Species SA62-7 which is the true *A. blumenavia* from Santa Catarina, Brazil made spikes with up to 7 flowers. This is a beautiful little species and is growing very vigorously. Mixed in with the bulbs received as Species SA62-7 were some other bulbs that also had the typical pear shape of *A. blumenavia.* These bulbs were of a black color rather than the reddish

color of *A. blumenaria* and were segregated out. Those that have flowered have turned out to be a form of *Habranthes robustus* and are possibly a little smaller than those in the trade and a more even pink tone. One bulb segregated with those considered to be *A. blumenaria* has a wider leaf than those found to be *Habranthus.* This may be a different form of *Habranthus robustus* or possibly an *Amaryllis* species. This single bulb is growing very rapidly and I feel it will produce flowers this summer if a *Habranthus* and next spring if an *Amaryllis.*

Fig. 27. *Amaryllis aulica* var. *stenopetala* as grown by Sam Caldwell, Nashville, Tenn., from a bulb imported from Santa Caterina (State), Brasil in 1959 by Dr. Robert D. Goedert, Box 6534, Jacksonville, Fla. Photo by Sam Caldwell.

The species PV63-2 from Kosnipata Valley, Cuzco, Peru, has flowered. The flower was small with two to the spike. It was very similar to the *Amaryllis* grown in India under the name of *Amaryllis belladonna* (syn. *A. equestris*). The foliage also resembled this species or hybrid. The only difference I could detect was that all petals except

the lower petals had yellow near the center; however, the lower petal in PV63-2 was solid red. The form of the flower was very similar.

Species LM63-1 has just flowered. This species from San Martin, Peru, is mid-way between *A. belladonna major* (Type: *A. belladonna* Iquitos, My No. 8-61) and *A. belladonna* (syn. *A. equestris.*) (Type grown in India under this name). Species LM63-1 made 2 flowers to the spike of a very bright scarlet with white green center. The coloring is more like *A. belladonna* (syn. *A. equestris*) and the shape more funnel shaped. The tepalsegs are just as long as in *A. belladonna major* but the flower does not open up as flat. It is a beautiful clear color. The bulb has a much longer neck than *A. belladonna* Iquitos that grows at Iquitos, Peru, not too distant away. This is no doubt a form of *A. belladonna* which appears to grow wide spread and in many forms in this general area of South America.

I have recently received a 15th species from Santa Catarina, Brazil. This species grows along rivers in this area. It is a small variety which is whitish with a pink overtone. The adult bulbs are about ½" in diameter. The basil plate of the adult bulb is larger than the bulb. They are white in color and appear much like a miniature *Haemanthus multiflora* bulb.

[Editorial Note.—This is *Nothoscordum inodorum* which is a noxious weed when grown outdoors in California as reported in an earlier number of Herbertia; when grown in the humid East it apparently is not such a nuisance. It is recommended that it be grown in pots and not allowed to go to seed. The bulb forms numerous bulblets which are the chief danger when grown outdoors in California.—*Hamilton P. Traub*]

Although my venture in collecting species *Amaryllis* has been a considerable financial loss to me, I do hope in some manner to continue these efforts in the future. I believe with the use of these species some one can develop more free flowering hybrids, new colors and shapes.

At present one collector is on a very extensive collecting trip through Bahia, Goias and Minas Gerais, Brazil.

It is hoped that this trip will produce some new and interesting *Amaryllis* species.

GOLDEN RULES FOR GROWING HYBRID AMARYLLIS

MRS. A. C. PICKARD, *Houston, Texas*

Individual hybrid *Amaryllis* plants vary greatly in their behavior under cultivation. Some are almost evergreen; others lose all their leaves in late fall. Some delay their flowering for several months; others have a short dormant season.

These differences can be attributed chiefly to inherited factors, but also to a lesser extent to environment, and to the kind of culture given during the preceding season. Because of these variations it is advisable not to force into growth.

It is with these thoughts in mind that the following suggestions are made for handling hybrid *Amaryllis*.

(1) *Quality Bulbs*—"Plant a good bulb and you will have a good flower" is an almost invariable rule. Purchase large healthy bulbs, for wise investment is not usually based on bargain offers.

(2) *Proper Handling of New Bulbs*—Keep bulbs in a cool dry place until time for planting. The bulbs may be stored in the home refrigerator. Place bulb in a plastic bag, fasten tightly and store at a temperature that keeps vegetables. This method is especially beneficial to hold bulbs dormant for a longer period.

(3) *Potting Procedures*—Select a clay pot to accomodate the size bulb. Avoid an overly large pot. An inch all around between bulb and pot is adequate. Prepare the clay pot by soaking twenty-four hours before using. Provide proper drainage and fill with the potting mixture to the level at which bulbs are to rest. This will vary according to the size of bulb being planted. Set the bulb firmly at a depth to permit exposure of the top third. Newly purchased bulbs may or may not have roots attached. If you want to be extra kind to your bulbs, coat the basal plate lightly with Rootone, a hormone preparation, just before planting. This deters bacteria and fungi which causes rot and has a beneficial effect on root growth.

(4) *Soil Mixture*—A proper soil for bulb growing remains important. Good soil may be prepared at home by combining 1 part sharp sand, 1 part well sifted garden soil, 1 part rotted dairy fertilizer (or ½ part dried sheep manure), 1 part leaf mold (or humus). Add 2 cups of bone meal, 1 cup super phosphate 20% to each bushel of mixture. Mix well until all material crumbles in your hands even when moist.

(5) *Rest and Resurrection*—Keep the newly potted bulb in a semi-dark place with temperature around 50-60 degrees F. for about six weeks for root making. Water sparingly. Too much moisture induces bulb rot. Also it stimulates foliage growth and retards the budded stem before it emerges from the bulb, sometimes even causing failure of blooms. When the bud is well protruded, move the plant gradually to light. Water more as growth advances.

With bulbs grown last year in pots or directly in the garden bed, to encourage early bloom, bring the pots indoors or lift plant from garden. Give them a complete rest from food and moisture until foliage has dried off—then retire them for rooting just as you would a new bulb with the same potting procedure. The bulbs are then ready to repeat their growing cycle.

(6) *Suitability to Environment*—The plants must be adapted to the condition which will exist when they are placed in a lightly shaded garden spot. Select a possible site for planting and prepare a rich soil in a raised bed, at least 6-8 inches above ground level, to insure perfect drainage. The bulbs appreciate moisture but not wet feet. The bulbs may work their way deeply into the ground, especially when planted in a friable soil. It would be rash to plant them too deeply in the first place as the bulb cannot make healthy foliage when the bulb is too deep beneath the soil. *Amaryllis* develop a great mass of fibrous roots but these will deteriorate rapidly in soggy soil.

(7) *Mulch the Garden Bulb*—After bulbs are planted it is beneficial to cover the soil with two to three inches of mulch to conserve moisture. Keep the soil cool, discourage weeds, and eliminate the need for cultivation. Mulching with organic matter plays an important role because it is rich in beneficial soil bacteria. Use the most convenient mulch obtainable in your area and it is advisable to provide extra nitrogen to counteract the "tieing up" of nitrogen by the decaying cellulose. A very heavy mulch will reduce danger of damage by a freeze and it is a must to be prepared for the unexpected.

(8) *Fertilizing*—*Amaryllis* are heavy feeders and enjoy a well balanced meal of nitrogen, potash and phosphates plus all the minor elements about which we hear so much these days. Natural, well rotted dairy fertilizer (sometimes hard to obtain) but most rewarding, reinforced with a nice top layer of decaying leaf mold benefit the plant directly. Whenever this material is not obtainable, any method of soil management that emphasizes a program of regular fertilizing and maintenance of good soil structure is a must for *Amaryllis*. Selection of a suitable fertilizer is a problem to be solved.

(9) *Moisture or Water Supply*—Water, the universal solvent, is the only way plants can obtain mineral nutrients. Plants absorb water through the roots and transpire it through the leaves and green stems. Adequate water keeps plants in good condition and greatly increases quality and number of blooms. Water loss is influenced by light, relative humidity, air temperature, and air movement. Purely local experience is of greater value than the broad advice that I must give to suit all conditions. The depth and density of the water absorbing surface is dependent on the type of soil.

(10) *Effect of Cutting Flowers*—One of the frequent questions asked concerns the cutting of blooms. It may even strengthen the plant if the blooming scape is cut when the flower is partially opened. The flowers will develop just as well if the scape is placed in about 2 inches of water. Wrapping a small rubber band around the base of the scape will prevent splitting and folding up of basal sections. All *Amaryllis* are splendid for indoor display and may be cut with as long a scape as needed with caution not to cut too close to the bulb. Remove faded flowers and scapes as the hollow scape of the *Amaryllis* contributes very little to the bulb but is a great strain on the bulb if allowed to remain and form seed. Therefore, it is best to select only the parents needed for hybridizing. Occasionally the mother bulb will skip a year or so of blooming after pollination and seed setting. But, ripening of foliage is essential. The period of yellowing leaves is vital to the development of the new bulbs. It is at this time that it stores food which will carry it over to the next season.

Growing Amaryllis is a never ending source of enjoyment.

GROWING AMARYLLIDS AND OTHER SEEDLINGS ON WATER

DAROLD DECKER, *Chula Vista, California*

Sometimes I wish that I hadn't thought of it. For over 3 months the various angles of it have completely "plagued" me.

It all began while reading Dr. Traub's AMARYLLIS MANUAL, page 123, in which he recommends floating *Amaryllis* seeds on top of tap water for 24-48 hours prior to planting. The thought kept recurring to me, "floating seeds on top of tap water," until I did just that. I filled a small open-mouth jar about 3/4 full of water from the faucet, and sprinkled in about 25 *Amaryllis* seeds. They floated like little boats. Well, I didn't leave them float for a mere 24-48 hours, but just *left* them float. Within about a week, I held the jar up and could see clean white roots emerging from the seed. "This is interesting," I thought; "why not just leave them float some more and see what happens?" They continued to grow. After a month here is what happened: they had developed the radicle-root about an inch in length, the cotyledon-leaf nearly the same length, and a miniature bulb. All of this in nothing but water. At that stage I transplanted them to a flat of well-decomposed oak leaf mold, which I haul in from the mountain areas, about 40 miles east of San Diego, and which I find very satisfactory for starting things, as it is entirely free of damp-off and clean and friable. I soaked the flat prior in water, left drain, made good size holes with my finger, and inserted the roots of the tiny plants. Then I placed the flat in the cold frame and covered about ten days with a cloth sash. This, then, is essentially all there is to it.

But it still intrigued me. Another test June 13th is still in water at this writing (September 23rd). The water remains almost crystal clear, some of the cotyledons are about 6″ in length. About 3 weeks ago they seemed to be getting a little pale, so I added a small amount of fertilizer solution. I believe this helped as they are of a healthy green color now. They continue to float as aquatic plants, mostly entirely submerged in the water.

More recently I thought, "If *Amaryllis* can be started this way, there must be many more kinds of plants that could be similarly started." I have since experimented with such things as Zinnias, Marigolds, Gerbera, Salvia, Petunia, Snapdragon. Germination has been excellent with all. However, the Zinnia, Marigold, and Gerbera became clouded and murky, apparently with fungus development. The Petunia and Snapdragon jars, however, have remained perfectly clear. It is curious to note that these tiny Petunia and Snapdragon seeds soon sink to the bottom of the jar, though in this way completely submerged, their germination appears to be in no way impaired. After germination, the young plants become detached from the seed hull and usually float at or near the surface. The plants are now 3 weeks from sowing, perfectly healthy and seem completely at home in water. It is curious to note that with time, the plants seem to toughen, and even though small can be quite readily handled. I have transplanted to flats of

leafmold tests of these Snapdragon and Petunia seedlings without difficulty. I believe the limits of most plants in water is the development of the cotyledon stage. However, Salvia has developed a rather extensive little fibrous root system, and fairly large true leaves already.

This novel method of growing seedling may, therefore, be divided into two parts: (1) Sowing seeds on water, for which I am indebted to Dr. Traub's suggestion, and (2) leaving them float. I believe with *Amaryllis* that they should float from 4 to 6 weeks. That is, they might as well float for that length, as they suffer in no way in the water, and as they develop to a larger size, are easier to handle.

Another more recent thought with me, which I believe is of importance with this system, is the use of boiled water to eliminate any possibility of fungus development from the water itself. Also, I purchased some heavy plastic dishes (made by Tri-State Plastic Molding Co., Chicago, and I believe available at most dime stores.) These are rather inexpensive and come in several sizes. They are clear like glass, and have a lid. For example, size 5″ x 6½″ x 2½″ deep will conveniently hold about 100 seeds, and on the label is the description: "New high heat material, can be scalded to insure germ free protection." After the water came to the boiling point, I poured it into these plastic containers, and immediately replaced the lids and left cool. After complete cooling, I sowed to more *Amaryllis*, Marigolds, Zinnia, and Salvia, immediately replaced the lids, labeled, and stored on a shelf. My theory here, besides positive elimination of all possibility of fungus from the water, is that the floating seed is protected by the lids from contamination from mold fungus in the air. Many seeds are like bread under humid conditions, they attract mold, which is pretty much everywhere, and this is particularly serious when directly exposed to air, either atop water or soil. So far this phase of the experiment looks very promising with roots on the germinating Marigolds and Zinnias very clean, and comfortable looking, floating on the water. Boiling the water and using a container with a lid, and never removing the lid during the experiment is, I believe, a very worthwhile idea, and offers positive protection of growing the seedlings in a completely sterile media.

Still thinking on the problem, just yesterday I happened upon the thought of adding a bit of fungicide to the water. Something that would completely control all fungus development either from the water, container or seed, without affecting the development of the seedling. I believe this is a very practical approach, and might solve things completely. I have tried weak solutions of Manzate, a manganese compound widely used as a spray to control various fungus developments on plants, and also "Lavoris" brand mouth wash, which is largely zinc chloride. Both seem very effective against plant fungus, and only further time will tell of the effect on plants. It seems likely that something could be used to give positive control, without interfering with the normal development of the young seedlings. It is essential for the normal development, that all mold should be kept from developing.

All of this is, of course, very simple. One doesn't need expen equipment. It doesn't take up much space or any considerable tim in fact, one of its purposes is to save time. I believe I have so of the essentials figured out, but it is likely that others may th of variations of the idea, refinements or better ways of doing it. I at the beginning. I am sure it will appeal to the hobby garden and may even have practical application for the grower of larg amounts. I believe it will be found that many if not most seeds actua germinate better and at higher percentage in sterile water than soil or other media. For this reason, it is possible that this method w have further practical application for seed firms who regularly ru germination tests of seed.

I mentioned this idea of floating *Amaryllis* seed on water to or of the retail catalog firms, to whom I sell (I am in the wholesale flowe seed growing business), and they recently wrote, "You will be in terested to know that we had the best germination with the *Amaryll* by sowing it on water as you suggested. We had no success usin Vermiculite and fair germination with soil." Actually, I have had pretty good luck planting *Amaryllis* in Vermiculite in plastic con tainers, as has been described in the Amaryllis Year Book. However I am sure floating on water is better. I believe one can be assured of the *maximum* germination. Later, I showed my results to a visiting customer-seedsman, and he was amazed to see these plants growing in the jar of water. I believe this would be the reaction of most people. It amazes me, yet, every time I look at the jar, and fills me with wonder.

Of course, no seed will germinate unless it contains life. *Amaryllis* and many other types of seed will attract fungus, especially during the warm humid months of late Summer and Fall, especially in the Southern and Eastern States. The seed pods should be left on the flowering stalk until they have matured. At this stage they will split apart, and may be removed, and should be thoroughly dried on a tray in the sun a week or so before either planting or storing for future planting. The pods should not be lumped together in a bag, while still containing moisture. Most seed firms have especially made air-tight rooms, in which the moisture is mechanically removed, and the humidity constantly kept very low, at a relative humidity of 30 or less. Many seeds that normally rapidly deteriorate may be kept in high germination for long periods—often many years, by this method. This, of course, is out-of-the-question for anyone not in the seed business. However, it is likely that sometime someone will find a simple and inexpensive way of maintaining the germination of small amounts of seed. I have been thinking, and plan to try a little experiment of storing packages of small amounts of seed in a south window, so that they will receive a good "drying-out" for several hours daily. This may be sufficient to prevent development of fungus on the seed, which I believe is the main reason for rapid deterioration of *Amaryllis* seed. If stored in a closed room, I believe an open can is better than bags of either cloth or paper, as it is likely that these in themselves attract moisture. This spring I planted 144 seeds in leafmold of an *Amaryllis* strain.

This seed had been stored in an open can, without humidity control. It was something that I wanted to get the most of. This seed was 11 months old, and I got 96 to germinate. Another word of caution about storing seeds. Never store seeds in a tightly closed container, unless the moisture level of both seed and container air has first been lowered very considerably. Since this is difficult or impossible without a rather expensive set-up, it should not be considered. Some might get the idea, too, of storing seeds in packages or bags in a closed jar or other container, with calcium chloride or other desiccant at the bottom to withdraw the moisture. This sounds reasonable. Many of the mechanical dehumidifiers operate under the theory of blowing air through a desiccant. However, under stable air conditions, a check with a hygrometer shows that calcium chloride doesn't lower the humidity to a safe level. The humidity remains too high to prolong the life of the seed. The germination is down. I have tried it.

Perhaps the best and certainly the most convenient way of maintaining seed germination of small seed lots is to place in a refrigerator. Here, one has the advantage of a cool temperature and a dehumidifying action, both of which are designed to promote the long life of seed. The life of certain seeds respond differently to different temperatures. Certain seeds will be killed by too low a temperature. However, I have kept, and at this time continue to have samples of certain seeds in the freezing compartment of my refrigerator, imbedded in ice, and at around 0°F. Some of these samples have been in such a state now for 3 to 4 years. I tested the Gerbera a year or so ago, and it showed no appreciable loss of germination. Normally, it is very short-lived. Salvia, on the other hand, is completely killed by this low temperature, though continues to germinate very well when stored at about 40°F. I have never tested Amaryllis seed under these conditions. Though this would be a very interesting experiment for someone.

Without question, the very best way for the person with small lots of *Amaryllis* seed and other types of relatively short-lived seeds, whether you save it yourself or buy it through a seedsman, is to plant it as soon as possible. Sowing on water is made to order for this. *Amaryllis* clones bloom and the seed matures over a period of several months. Sowing on water is certainly a most convenient way to handle crosses and seed from selections as it is mature and ready.

The real "beauty" of this water culture is that when once the seed has been sown, there is absolutely no further work until the seedlings are ready for transplanting. One could just as well go on vacation. The only precaution is that the temperature should be maintained above 60°F, and that the containers should not be placed in direct sunlight.

Under this method, too, you are growing in a perfectly sterile medium. About the only possible contamination is through the seed itself. This method is certainly less trouble and more fool-proof than sterilizing or fumigating soil to guard against soil-borne damp-off and other fungus diseases, which can attack the seed itself in the process of germination. These problems are normally ever present for all

growers, either the hobby gardener or one commercially engaged.

This method seems to fit the giant hybrid *Amaryllis*, perhaps many of the other amaryllis equally well. However, there are likely many other types of plants that can be just as well started in this way. I have always remembered the experience of Mr. Orpet, as told in the 1956 Yearbook, page 11, regarding *Alstroemeria violacea*, to quote: "Mr. Orpet procured 300 seeds, along with instructions for planting all of which indicated that no matter what the treatment of seeds "vernalization," cold or hot treatments, chipping, sulphuric acid, soaking in water, etc.," there must be a full year from planting to germination, and flowering might take place five months after that. Mr. Orpet put his seeds in a pan of water, was called away for nearly two weeks and remembered in panic that his seeds were still soaking on his return. He found each seed showing a little white germinal point, sowed them at once (in April) and was rewarded not only with a quick germination but 350 little plants (owing to a double embryo in some) a few of which flowered in June of the same year." So it is entirely likely that use of this method with *Amaryllis* is only a beginning. I am personally making tests of sowings in water of such tough germinating items as Canna and Rose, though won't hazard yet just what my luck will be.

I won't go all-out and say this *is* the way to start all seed. There are undoubtedly many variations of the method. Certain seeds may be better started this way, and transplanted to ground immediately upon signs of germination. Others are so easily started directly in soil that prior germination in water may prove just extra work. Too, there will be other types that can be germinated in water, though upon germination should not be left in that state perhaps more than a week, as they may not develop chlorophyll normally in water. And there will, certainly, be others that may advantageously be left in the water much longer than a month, and, with the addition of small amounts of nutrient, will develop quite normally under these conditions, prior to later transplanting to soil. I would think that certain easily grown kinds like Zinnia and Marigold could be transplanted directly to a prepared spot in the garden about 10 days after germination, with some immediate protection from sun and wind.

I wish to stress, too, that this, even to me, is still very much in the experimental stage. With this in mind, I believe it is very desirable to proceed modestly. At first test your methods in a small way. Don't start with your rarest seed, your most important crossed seeds, or your most valuable lots.

Above all practical values that this method might unfold for you, I believe as with all people who like to grow things and to whom germination and plant growth and development have something mystical and magic about them, you will enjoy peering daily through the glass or plastic container (for this reason glass or plastic is preferable to a metal container) and watch the seed germinate and develop into miniature real life plants. Grown in soil one actually observes only the upper half of the plant.

WINTER HARDINESS OF SOME AMARYLLIDS IN CENTRAL NORTH CAROLINA

WILLIAM LANIER HUNT

Recent severe winters have tested out the winter hardiness of many amaryllids. Since the writer's arboretum is right on the margin of hardiness for a number of these plants, the following report may be of some value.

Lycoris, sternbergias, rhodophialas, crinums, hymenocallis, zephyranthes, *Nerine bowdeni* and other amaryllids are grown in quantity here toward the northern end of Zone 8 in the South Atlantic States. The arboretum is located on the eastern edge of piedmont North Carolina. Before the recent extreme winters, the average of low temperatures for Zone 8 was 10 degrees above zero. The lowest temperature was usually 4 degrees below zero for several hours between 2:00 A. M. and dawn. With the coming of day, plants were subjected to bright sunlight (usually with no snow or ice cover) and sometimes to a rise to above freezing: the worst situation an evergreen plant can undergo.

Before the recent severe winters came along, the common old sterile form of *Lycoris radiata* bloomed profusely in most seasons. In 1959, however, a northeaster brought below freezing temperatures in November which damaged the foliage of this plant so badly that almost none of them bloomed in September, 1960. In protected places, they flowered normally.

Unusually deep snows in 1960-61 resulted in only 10 per cent of normal bloom in September, 1961. Then severe drops in temperature in 1961-62 down to 10 below zero with no snow cover had the same effect: about 10 per cent of normal bloom in September, 1963. The winter of 1962-63 was much like the previous one, and the effect this September was about 2 per cent of bloom in these same beds of several thousand bulbs.

Weeds and honeysuckle, however, had overgrown a very large new planting of these "red spider-lilies" as *L. radiata* is called in the South Atlantic States. To the writer's utter amazement, this new planting bloomed normally! So winter protection is very practical for *L. radiata* in Zone 8. We are relieved to know that, with a little trouble, we can be assured of blossoms in spite of 10 below zero for several days together in the December till Valentine's Day period.

It is good to be able to report, also, that *Lycoris elsiae*, which had flowered profusely every year before the past four winters, produced this year about 10 per cent of its normal crop of blooms in spite of the same deep freezes. Last winter, some beds of this species were protected by laying a light covering of "pine tops" (boughs) over them after the cold set in. In one large bed, there were no flowers this year, but in another, protected the same way, there was a 10 per cent flowering.

The new Dresden yellow *Lycoris* which fades to cream, and the new porcelain rose *Lycoris* (both described elsewhere in this issue) seem to be a bit hardier to cold than *L. elsiae*. This is possibly owing to the

slightly thicker foliage of these two new plants. In beds of *L. elsiae* where they were growing, they flowered when *L. elsiae* did not.

Here in the upper end of Zone 8, *Lycoris aurea* is not a practical outdoor flower. A bed of 100 bulbs planted back in the forties just wasted away until there were only a few feeble ones left in ten years. It is good to know from Mr. Caldwell that this species takes kindly to cool house treatment in deep boxes.

Lycoris traubii is hardier than the above because of its thicker, tougher foliage, but it also succumbs to the same difficulty as that of *L. aurea*: the foliage is too tardy in the autumn, and the first hard freezes damage it or destroy it outright. In some seasons, both of these lycoris will get ahead of the frosts, develop to the safe point and 'tough-it-out' with the winter. *L. traubii* then gives about 2 per cent of bloom, but *L. aurea* does not get up enough strength to bloom. Watering from September on will hasten the coming of the leaves of these two lycoris and might make them practical if a frame were then put over them. It will be a godsend if Mr. Caldwell's new yellow lycoris with spring foliage can fill the gap left by these two tender yellow species.

Before the past severe winters, *Lycoris squamigera* has nearly always supplied us here with great crops of flowers. In perhaps one season out of ten, it would be off and only an odd flower or so would appear. Recently, however, the late freezes in March and even in April have so damaged the foliage that this species has flowered only at about 25 per cent of normal.

Lycoris incarnata has never, during some twenty years flowered very profusely here, and it has bloomed even less during the past severe winters. In the experience of this writer, this species is chary of bloom until it has developed clumps of six or more bulbs. Does it bloom better in a drier clime or in limestone country? It seems to be grown as a cut flower in Italy.

Lycoris sanguinea, L. "cinnabarina" and their forms have been moderate bloomers here. Even in the past severe seasons, they have given 50 per cent of their normal bloom.

We have saved the best for the last and are happy to report that *L. sprengeri* has bloomed lustily every single year during the past few seasons. There has been a small colony of it here for some ten years—now increased to fifty to one hundred bulbs. This species looks rough and ready. The spring foliage has a little tiny red edge that may indicate its experience with extreme cold in its native habitat. Mr. Caldwell's "Sprenrad", then, combines the two most winter hardy lycorises and ought to be extremely valuable as far north as any lycorises will go. My own seedlings of this same cross certainly stand up to the worst the winter can produce.

The best form of *Sternbergia lutea* which I have grown for some thirty years has always come through the winters unharmed. Thick foliage, again, seems to be the deciding factor, for two batches of imported bulbs have thin leaves and often get damaged by freezes. Perhaps gardeners who report no success with sternbergias are trying to grow the thin-leaved types.

The past two winters have had some effect on even the best type of *Sternbergia*. Where a bed of several thousand bulbs extends out from under large sweet gums and oaks, the bloom was sparse this year (though foliage showed no injury), but the bulbs back underneath the trees bloomed as lustily as ever. This good type of *Sternbergia* is apparently one of the hardiest of all amaryllids. The same may be said of *S. fischeriana*, the fall-winter-spring blooming species which the writer has described and praised before in HERBERTIA. The twisted foliage of this species stands up to the worst that winter can bring on and flowers appear right in the snow as soon as the sunshine returns.

Rhodophiala x *huntiana* foliage has always been damaged by extremely low temperatures, but these floriferous bulbs can send up a new set of foliage as soon as warm weather comes in spring and bloom normally every August. The writer once performed an experiment with rhodophialas. Winter had destroyed one set of leaves on the bulbs and the new leaves had no more become mature than they had been cut off by the man mowing the lawn. Noticing that more leaves began shortly afterwards to come up, the idea struck us to see how long it would take this foliage to grow. It was then late June, but this third set of foliage developed rapidly until it had its full length. Shortly afterwards, the foliage was cut off some of these bulbs to see whether or not they might possibly come out again. To everyone's amazement, they did so right away.

Since the bulbs in question were in a bed of rich soil where flowers were growing, they received regular waterings through July and August, and their foliage again developed to normal size. At this point, one could not resist the temptation to remove the foliage from a few bulbs again. Still another set of leaves was produced, and many of the bulbs in question flowered at their normal time in late August.

Somewhere, the writer has read that this little *Rhodophiala* comes from an area in the mountains of Argentina where the soil slides off steep mountains, often burying the bulbs very deeply. This must account for the sometimes six- to nine-inch necks on the bulbs. The ability to produce successive sets of leaves when damaged makes this one of the most indestructible of the amaryllids.

AMARYLLIS CULTURE UNDER ARTIFICIAL LIGHT

RICHARD J. SUDD, *750 South Cavan Lane, Des Plaines, Illinois 60016*

The number of years an *Amaryllis* can be grown successfully under artificial light can only be answered by continued experimentation. After growing *Amaryllis* under artificial light and observing all phases of good culture, I am confident that *Amaryllis* species and hybrids can be grown indefinitely with success. (See Plant Life 1963, pages 107-110.)

As described by this writer in an article "Artificial Light for Amaryllis Growth" in Amaryllis Year Book 1963, the lighting arrangement has remained the same. The cool white fluorescent tubes used in

the past had been replaced during the spring of 1962, with "Gro-Lux" fluorescent tubes. In replacing the cool white fluorescent tubes with "Gro-Lux" tubes, I have placed most *Amaryllis* bulbs in two size groups to utilize the growing area and light source to the greatest advantage.

The first group consisted of all small sized bulbs placed under the light source twelve inches between the fixture and the tops of the pots. Most of the pots were three inches in size and consisted of *Amaryllis blumenaria*, *A. elegans* var. *divifrancisci*, *A. cybister*, *A. evansiae*, *A. striata*, *A. striata* var. *fulgida*, *A. mollevillquensis*, *A. reticulata* var. *striatfolia* hybrid, "Mrs. Garfield" and a number of unidentified species.

The second group consisted of the larger size *Amaryllis* bulbs placed under the light source twenty four inches from the top of the pots. Most of the pot sizes vary from five to seven inches. Included in this group are *Amaryllis belladonna*, and its varieties, *A. aulica*, *A. aulica* var. *platypetala*, *A. immaculata*, *A.* x *johnsonnii*, *A. pardina*, *A.* x *acramannii* and the various strains, some of which I find difficult to grow out of doors.

There are many plants, which have wider tolerances and become easily satisfied for continual development. Of course there will also be some bulbs which will need special care because if they are lost, replacements will be hard to find. All phases of culture, containers, growing media, fertilizing and watering, play an important part under conditions of an enclosed environment.

Today many substitutes are being offered for clay pots, but clay pots offer the greatest advantage in my growing area, especially when fresh air circulation is limited during the cold winter and spring months. Clay pots being porous, help promote aeration of the growing media and I find this beneficial to the healthy growth of the *Amaryllis* bulb.

The only disadvantage of clay pots is the accumulation of fertilizer salts from heavy feeding during active growth. If there should be fertilizer salt accumulation, it is best to clean the clay pots as the *Amaryllis* starts its resting stage.

At the start of growing *Amaryllis* under artificial light I used various growing media to see which gave the best results for healthy growth under the environment created. Presently the commercial mixture "Black Magic" has given excellent results for all bulbs. The main reason for its use besides being clean and odorless is that the need for organic fertilizers is eliminated. In some cases I added sand, perlite or leaf mould. When soil mixtures were used, continual watering and fertilizing usually packed the soil, creating poor aeration and eventually rotting the base of the *Amaryllis* bulb.

Since organic materials such as manures, bone meal, etc., are essential for good *Amaryllis* growth, their use indoors in a confined area would be unbearable. In using "Black Magic" mixture, excellent results were obtained with soluble chemical fertilizers. During active growth of the bulb, two soluble fertilizers were used, with good results, Rapid Gro (20-20-20) and Hyponex (7-6-19). A monthly application of muriate of potash was used, with good results.

During active growth all *Amaryllis* respond to heavy fertilizing. In using commercial fertilizers, various factors have to be taken into consideration, to obtain maximum efficiency. Depending upon whether they are *Amaryllis* species or hybrids, pot size, air circulation, heat application, fertilizing and watering will vary. As pot sizes vary, fertilizing and watering will also vary. The best guide I have found, as soon as the surface of the growing medium shows signs of drying, then the bulb is watered or fertilized. I try to alternate watering and fertilizing and when possible use collected rain water.

Many of the *Amaryllis* species which I have, are impossible to grow out of doors. The *Amaryllis* hybrids, a majority of which bloom in the spring, are about the only bulbs placed out of doors for continued growth.

Amaryllis aulica, the species which I have grown longest (4 years) under artificial light in the complete absence of sun, has bloomed faithfully for me for the past four years. Under artificial light *Amaryllis aulica* will remain evergreen, with active growth starting in October. The bulb will bloom during December with the flowers lasting a period of two weeks. After blooming, the bulb sets new leaves with the older leaves yellowing. Watering and fertilizing are continued until June when fertilizing is discontinued, but it is watered to keep the growing media moist.

During the blooming period of December 1962 *Amaryllis aulica* put out two flowering scapes and this caused the bulb to decline considerably. I doubt whether the bulb will bloom the fifth year.

The summer flowering *Amaryllis* x *acramannii* is another excellent bloomer under artificial light. The flowers of the bulb are very erect and do not fully develop. *Amaryllis* x *acramannii* like *Amaryllis aulica* is treated as an evergreen. The blooming period for this hybrid has been between the first and third week of July. The second year under artificial light this bulb produced one offset with the mother bulb increasing in size each year.

Amaryllis striata which blooms in January is another species that remains evergreen. This species shows more vigor than its variety and is easily grown under artificial light.

Amaryllis striata var. *fulgida*, another evergreen species is unpredictable in its blooming period. Some of the bulbs have bloomed in June, others have bloomed in October and January. As soon as this species blooms, it has a tendency to enter a resting stage and watering and fertilizing is withheld. The growing medium is kept moist, but if overwatered, this bulb will rot. The flowers of this species under artificial light, last longer than most of the species.

Amaryllis belladonna var. *major* is another good grower under artificial light. A one third proportion of sand is added to the growing mixture of "Black Magic" for this species, with good results. This species also remains evergreen under artificial light, with active growth starting in the latter part of February. Watering and fertilizing is continued to the end of October and afterwards this species received just enough water to keep the growing mixture moist. Under artificial

light the bulb I have has produced one offset during a two year period.

Amaryllis immaculata, another summer blooming species with its active growth starting in June, has not been successful with outdoor culture. When this species was received and grown out of doors, it was impossible to get it to bloom. Under artificial light this species is a good grower, with active growth lasting until January when it will go into a dormant stage. During the dormant period of this species, watering is withheld completely.

Amaryylis aulica var. *platypetala* is treated as an evergreen species. During August and again in October this species will put forth vigorous leaf growth. The flower form is similar to *Amaryllis aulica*, but the color is a pure crimson with the absence of green in the throat. Until the present time this plant has bloomed during November.

Amaryllis reticulata var. *striatfolia* hybrid "Mrs. Garfield" is a clone, which shows evergreen characteristics under artificial light. The potting procedure has been similar to that of *Amaryllis striata* var. *fulgida* with the bulb resting on top of the growing media. Active growth starts during August and lasts to May when the leaves yellow. Usually this bulb puts out from three to five leaves and has not bloomed for me after two years growth under artificial light.

Recently three bulbs of *Amaryllis evansiae* were received from Mr. Wyndham Hayward. Good results were obtained when two of the bulbs were planted with the neck of the bulb protruding above the soil line. The one bulb planted with the lower half placed in the growing medium, declined and eventually rotted. Since planting, the remaining bulbs have retained their leaves with moderate watering and fertilizing. In watering *Amarylliss evansiae* I find it best to allow partial drying of the growing medium. The bulbs I have are small and because of this I have been handling them as seedlings.

Amaryllis elegans var. *divifrancisci* as well as *Amaryllis cybister* are two bulbs which when planted, remained dormant throughout an entire growing season. Even with bottom heat it was impossible to break their dormancy.

Amaryllis cybister showed good growth when its dormancy was broken the following growing season. During the time when dormancy was prevalent, watering caused decline to that portion of the bulb above the soil. The following season the bulb was planted with just the neck of the bulb above the soil line. Active growth was good, starting in April and by the end of August this species was in its dormant stage.

When dormancy in *Amaryllis elegans* var. *divifrancisci* was broken the following season, this species gave poor growth. The leaves put forth extended about a half inch in length and remained this way throughout the remainder of the season. Whether this species will give better growth the following season remains to be seen.

The past few seasons Mr. Robert Goedert of Jacksonville, Florida has offered many interesting *Amaryllis* species from South America. Practically all the bulbs which I received were good growers under artificial light during the first season. Many put forth offsets and these showed good growth when left attached to the mother bulb. Those

detached from the mother bulb and not having some root system tend to go dormant.

One noteworthy species from Santa Catarina, Brazil, was received from Mr. Goedert and identified by number SA62 7. What makes this species distinctive from the others is the leaf structure and the pattern set by the eight leaves the bulb puts forth. The bulb showed vigorous growth in the late winter when received and continued growth until early August when it went into a semi dormant stage. At this writing the bulb is starting active growth and I am hoping for it to flower at this time.

The leaf at its narrowest point was 1/8-inch (petrole) and two inches at its widest point (blade) with the length of the leaf measuring approximately nine inches. The petiolate leaf formed by this species and its miniature form makes this a noteworthy addition to any collection. [Editorial Note:—This is apparently *Amaryllis blumenavia.*]

Practically all *Amaryllis* species I have received were devoid of any root system. Many of the species i.e., *Amaryllis cybister*, *Amaryllis elegans* Var. *divifrancisci* and some of the unidentified species remained dormant throughout an entire season. Care must be taken in watering because over watering will cause decline and eventual rotting. Hormone powders have helped, but patience will still have to be exercised.

I believe it is best to encourage a good root system even at the expense of losing a flower bud of any given species. When allowed to flower the bulb will decline and in some instances start to rot.

Bottom heat has also helped in breaking the dormancy of some of the species, but care must be exercised. When bottom heat was used, placing the potted bulb on top of the fluorescent fixture has been sufficient.

One of the greatest advantages in growing *Amaryllis* under artificial light is in handling them from seeds. We have an uninterrupted season for continued growth, which is necessary in growing *Amaryllis* from seeds. The handling of *Amaryllis* from seeds is a subject which I would like to discuss in a later article.

GROWING AMARYLLIS CALYPTRATA FROM SEEDS

Burr Clouette, *California*

My *Amaryllis calyptrata* seedlings are now almost 18 months old. All of those which I have not traded off are thriving. One bulb is far ahead of the others in size. The bulb is all of two inches in diameter. The two largest bulbs were grown in the house under Gro-Lux lights. This would seem to indicate that this type of lamp is excellent for growing *Amaryllis* as well as other plants.

The *A. calyptrata* bulbs are all planted in Black Magic planter mix, and are fertilized regularly. One of the bulbs is still in its 3½″ square plastic pot; three others are now in 5″ clay pots, and the largest is in a 6″ clay pot.

Amaryllis calyptrata is evergreen and seems to grow the year round. I have not noticed any pronounced periods of inactivity, as in *Amaryllis evansiae*, which is also evergreen but is inactive at times. *A. calyptrata*

Fig. 28. *Amaryllis calyptrata* seedlings as grown by Burr Clouette, San Diego, Calif.

also seems to like lots of water and fertilizer. I keep the potting mixture at least damp at all times.

I hope that my largest bulb will flower next spring (1964).

(CONTINUED from page 53.)

THE ORIGIN OF ADAPTATIONS, by Verne Grant. Columbia Univ. Press, 2960 Broadway, New York, N. Y. 1963. Pp. i—viii + 606. Illus. $12.50. This important new book by an outstanding authority on the causal theory of bioevolution as applied to diploid sexual organisms will be welcomed by all biologists. In Parts 1 and 2, the author lays the general foundation for Part 3, in which the genetical theory of bioevolution within populations is detailed. In Part 4, he extends the exposition to include the formation of primary evolutionary population units. In Part 5, the bioevolutionary process as previously explained is applied to the subject of the hierarchic lineages. Dr. Grant has given by far the best presentation of the bioevolutionary process up to the present; incorporating not only the previously published information but also original contributions of his own. This stimulating, clearly written text is highly recommended to students of bioevolutionary theory, and also to biologists generally.

(CONTINUED on page 118.)

PLANT LIFE

VOLUME 20

[Nos. 2-4, incl., Apr., Jul. & Oct.]

1964

GENERAL EDITION

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(CONTINUED from page 116.)

EXPERIMENTAL BIOLOGY, by R. W. Van Norman. Harcourt, Brace, Englewood Cliffs, N. J. 1963. Pp. 243. Illus. This is an introduction to methods, techniques and instruments used in experimental research in biology, and is particularly useful to the beginning student. The introductory chapters are concerned with science and research in general, and biological science in particular. The main body of the text is devoted to the methods, techniques and instruments commonly used in experimental biology. The concluding chapters are concerned with the design of experiments; the handling of experimental data; and the preparation of manuscripts. Highly recommended.

SELECTED BOTANICAL PAPERS, edited by I. W. Knobloch. Prentice-Hall, Englewood Cliffs, N. J. 1963. Pp. 311. Illus. Realizing that for many the first course in plant science is usually the last, the editor has provided a rich harvest of background material for the course. This is calculated to make it rich in cultural, aesthetic and philosophic values. The background papers, selected from ancient, middle modern and contemporary sources, are arranged under such headings as the importance of plants; development of botany; ecology; phytogeography and exploration, etc. This is a valuable companion for both the plant science teacher and the student, and is highly recommended.

THE DEVELOPMENT OF HOMEOSTASIS, edited by E. F. Adolph. Academic Press, 111 5th Av., New York 3, N. Y. 1962. Pp. 218. Illus. $7.00. This book makes available the Proceedings of a Symposium on the Development of Homeostasis, with Special Reference to the factors of the Environment. The symposium, in which 39 outstanding authorities participated, was held at Liblice in 1960 under the Chairmanship of Dr. E. F. Adolph. The three concepts discussed ranged from (a) homeostasis (physiological regulations; homeokinesis; maintenance of constancy); (b) the study of ontogeny of regulatory phenomena in organisms; and (b) the study of body fluids, and their maintenance. This stimulating book is required reading for all physiologists. Highly recommended.

GENETIC EFFECTS OF RADIATIONS, by C. E. Purdom. Academic Press, 111 5th Av., New York 3, N. Y. 1963. Pp. 173. Illus. $7.00. This concise, clearly written book by an outstanding authority is intended for the intelligent layman, and also for students and workers in various fields of science. The Chapters are devoted to basic radiation physics; principles of heredity; genes—the material of heredity; the production of mutations by radiations; quantitative aspects of radiation mutagenesis; factors which modify the genetic effects of radiations; genes in populations; mutation in man; and genetic radiation hazards in man. Highly recommended.

ATOMIC ENERGY ENCYCLOPEDIA IN THE LIFE SCIENCES. Editor and major contributor, C. W. Shilling, and Miriam T. Schilling. W. B. Saunders Co., W. Washington Sq., Phila. 5, Penna. 1964. Pp. 474. Illus. $10.50. This important new book was prepared under the auspices of the Division of Technical Information, U. S. Atomic Energy Commission. There are more than 1,200 alphabetically arranged entries. Under a table of contents the entries are classified under 15 major headings:- radiation; elements and radioisotopes; radiation biology; genetic effects; somatic effects; prevention and treatment; accidents; radioisotope uses; health protection; environmental contamination; waste disposal; instruments; accelerators, reactors, power; weapons; and administration, laboratories and organizations. It is hoped that in the next edition, where practicable, brief references to further reading may be added at the end of the entry. This valuable reference book is important not only for specialists in atomic energy, but also for biologists, medical researchers, specialists in agriculture, teachers and students, and civil defense and public health officers. Highly recommended.

THE HUNT ARBORETUM

WILLIAM LANIER HUNT, *Chairman, Board of Advisors, North Carolina Botanical Garden*

The expanding population in the United States is rapidly causing the destruction of the natural resources of forests and animals. This situation has been coming on rapidly in this century, and, unless the choicest areas are preserved for posterity, they will be swallowed up and destroyed by the present "population explosion".

In 1926, I arrived at the University of North Carolina with two truck loads of irises, bulbs and rare plants which I had had with me in Preparatory School at Woodberry Forest, Virginia. I had thought that the Coker Arboretum at the University was an active botanical garden. It turned out, however, to be only a beautiful small collection of native and exotic plants. Since there was not much active botanical and no horticultural work going on in the Arboretum, I betook myself to Europe on a summer study trip.

Anyone who knows Kew Gardens can understand why Kew would inspire a young horticulturist born in a plant nursery to try to establish a botanical garden at home in the wonderful Southern States. Inspired by my old friend, the late Mr. Raffill of the Temperate House at Kew, I came home exhilarated.

Botany students, geologists, zoologists, hiking enthusiasts, faculty members—in fact, almost everybody at the University of North Carolina used to walk to Laurel Hill to see the wild rhododendrons or "laurels" when they bloomed in April. On the sides of a deep gorge in a slate valley with Morgan Creek at the bottom, the purple *Rhododendron catawbiense insularis*, trailing arbutus and many, many wild flowers thrive. It has long been known that the fall line slate valleys of the Southeastern States are full of treasures. Mountain species have been noted in them since John Bartram, "the king's botanist" and his son William traversed this country in search of the wonders of the "New World". Laurel Hill is a splendid example of the slate valley. Many of the mountain species overlap here with those of the Coastal Plain. Rhododendrons grow in sight of Yellow Jessamine (*Gelsemium*), and mountain plants like kalmia, *Azalea arborescens* and fothergillas mingle with coastal species like *Vaccinium arborescens*. The bottom of the gorge is about 260 feet above sea level, and the sides ascend quickly to 350 feet.

It was a case of "love at first sight" when I happened upon Laurel Hill on a walk in the woods in 1926. Suddenly, there was a deep valley below me with a musical stream at the bottom almost as big as a river, rushing over rocks and boulders. The site of an old mill, now washed away by a spring freshet, completed the picture of a real mountain valley transported to the eastern edge of the Piedmont.

Surprised that the University did not own this beautiful and dramatic area, I set about the long and tedious task of acquiring it. After I had searched the country for some seven years for the heirs to the property, the newly discovered heirs proceeded to sue each other for several more! Altogether, more than twenty years elapsed—and a world war—before Laurel Hill was bought and paid for.

The proximity of the Laurel Hill gorge to the campus of the "first State University" makes this small area of some 125 acres extremely valuable as a natural teaching laboratory. From the hills above the gorge, one can tell time by "South bell", and the Departments of Botany, Zoology and Geology have always used this area for field trips.

Long before I had taken title to Laurel Hill, I had begun to explore its steep sides, often hanging onto trees and shrubs. "Nothing like this in Kew, Edinburgh, Cambridge or "Jardin des Plantes," I thought. "Eventually, there will be an arboretum and botanical garden here. . . ." Shortly after the deed to the property was in hand, I began to open up some trails and roads into the densely overgrown area and to plan its ultimate layout. Then, in 1960, I began to transfer the land to the University as the Hunt Arboretum, to be administered under the new North Carolina Botanical Garden.

Because of its eminent and distinguished faculty, its excellent botanical library and especially because of the presence of the Ashe Herbarium of Southern Plants, the University of North Carolina is a most advantageous place for the establishment of a botanical garden and arboretum. As we have noted, the location near the fall line half way between the mountains and the sea and about half way between New York and Florida allows for the successful cultivation of many plants from colder regions along with those from warmer ones. There is certainly a great opportunity here to create an almost complete living collection of the plants of the Southeastern States.

BOWLING GREEN STATE UNIVERSITY PLANTARIUM

NATHAN WILLIAM EASTERLY, *Botanist and Plant Naturalist*

Three acres of land have been set aside for the establishment of a Plantarium at Bowling Green State University, Bowling Green, Ohio. As the need arises, more land may be added. It is my hope that we can have a great variety of conifers, deciduous trees and shrubs, and other herbaceous plants of special horticultural interest which are hardy in our area.

Bowling Green is located in a productive farming area of Ohio. During the glacial period, northwest Ohio was covered by Lake Warren. The sandy shores are still evident as sand ridges. As the lake receded, the area remained swampy. Black muck associated with the swamp gave this part of the state the name, "The Great Black Swamp." In 1859, a law providing for public ditches paved the way for drainage of the land. Northwest Ohio today is one of the state's most productive rural areas.

During the past decade there has been a significant increase in our student population. It is my firm conviction that many of these students will become interested in plant life if the necessary facilities are available. Most of these students will not become professional plant scientists but many will become teachers. If a well planned school garden, including greenhouse space, can be established and maintained here at Bowling Green, this will benefit not only the students, but faculty members, other citizens of Bowling Green, or any interested lay person in northwest Ohio.

Any suggestions, help, or encouragement of our plantarium will be greatly appreciated.

BLANCOA CANESCENS FROM WESTERN AUSTRALIA

W. R. STEVENS, *Bastia Hill, Wanganui, New Zealand*

Blancoa canescens Lindl., a singular member of the *Haemodoraceae* appears to be rare in cultivation, which is rather surprising considering that it is still fairly plentiful in its native habitat. Its home is in Western Australia where it occurs mostly on the sand plains north of Perth, with some isolated colonies quite near Perth.

Lindley named this monotypic genus in honor of a Spanish botanist, Manuel Blanco. In Australia the common name of Red Bugles has been bestowed on it.

Although I have known of this plant for a great many years, I was not able to procure seed of it until three years ago. Only six seeds germinated, and three of them promptly died. The remaining three grew well, and were potted up. At the age of four months, when they were about three inches high, they were planted out in a well-drained sunny position. All of them grew well, and at the age of eighteen months, one plant had a few small flowers, though these were not typical. This year the plants are flowering well.

In growth it resembles some species of *Sisyrinchium*, but the leaves are much coarser and more rigid, growing to a height of about ten inches. Each division or fan is attached to the main root below the soil level, and does not make independent roots. This means that propagation by division is not exactly simple.

The slender furry flower stalks emerge from the fans in March or April (autumn), and buds appear shortly afterwards. These pendent buds are of a rusty red, becoming much brighter as they develop which is very slowly. The number of buds on each stalk varies on each flower stalk from three or four to eight or nine, occasionally up to twelve and are produced in sets of twos and threes. As the flower develops, the six pointed perianth opens out to a horizontal position, showing the pale orange inner colouring. Although not of a spectacular beauty, the slender richly coloured scape is truly charming. The flowering period extends from August (early spring), until the end of October.

It is to be hoped that the Red Bugle flower of Western Australia will gain the wider distribution it deserves, now that seed is becoming avail-

able. Interested gardeners may possibly obtain seed from The Director, Botanical Gardens, King's Park, Perth, Western Australia.

[Editorial note.—Under date of Sept. 10, 1963, Mr. Stevens requested information about the relationship of the genus *Blancoa Lindl.*, to other groups. In Kew Index, published in 1895, p. 310, it is indicated as belonging to Family *Haemodoraceae;* and as far as the writer knows no change in its status has been made.—*Hamilton P. Traub*]

EASILY MANAGED ORCHIDS

A report by J. W. Blowers on easily managed orchids, the various species of *Pleione*, closely related to *Coelogyne*, is to be found in Gardeners Chronicle February 4, 1961, page 94. This beautiful plant may be grown in the cool house, or the coolest position in the intermediate house. *Pleione* formosana, P. Pricei, P. humilis, P. hookeriana, and P. limprichtii, are the hardiest. P. lagenaria, P. praecox, and P. maculata, require a little more heat—about 55°F. The beautiful flowers are produced from winter to spring, and last for about 14 days.

A BEAUTIFUL BROMELIAD

GRANT V. WALLACE, *Berkeley, California*

The bromeliad in question, *Puya alpestris*, sometimes known as *Pitcairnia caerulea*, was given to me by the late Mrs. Anson Blake, who had a lovely estate and botanic garden in Berkeley, since taken over by the University of California. The plant is rugged and hardy, a native of the Andean slopes of Chile. It has bloomed but twice in my experience, eight years apart: once in July, 1955; and at the time of writing, August, 1963. It is well worth waiting for. The flower stem resembles that of a yucca; the whole plant has a yucca-like habit, for that matter. The infloresscense is a many-branched spike, with the lovely flowers opening from the bases of the spikelets upward. The perianth consists of three conspicious, colored segments, with the other three short and obscure, resembling a calyx. The color is a hard-to-describe green, somewhat like verdigris. Each flower has a little pool of clear nectar within its base; I tasted this liquid and found it to have a very pleasant, faintly sweet flavor. I can't recommend the plant for quick results, but it is a sight to behold when it finally decides to unfurl its inflorescence!

ANTHOLYZA BREEDING PROGRAM

HAMILTON P. TRAUB

When the writer moved to La Jolla on the Pacific Ocean, he found on the grounds a naturalized South African irid which appears to be *Antholyza intermedia.* He also noted that it was naturalized or cultivated in gardens elsewhere in the vicinity. At first he tolerated it

but also eradicated some of it, but as he observed it over an eight year period he finally began to appreciate its value. It flowers profusely in January—March, has a very informal character that makes it valuable in flower arrangements, and thrives under utter neglect. It dies down in June at the beginning of the 3—4 months dry period, and emerges with the rains in October, and then blooms from January to March. The flowers are bright red. It seeds profusely so that it can be easily propagated either by seeds or by offset-cormlets. In 1962, the writer decided to begin a breeding project to improve this subject still further, but there are no other species available here at present. There are about 18 species—4 in tropical and the rest in South Africa.

For the breeding program, the following are wanted particularly, although any of the other species would be acceptable—*namaquensis* (red), *nervosa* (scarlet), *pulchra* (violet-purple), *cunonia* (red), *aethiopica* (red and yellow), *aethiopica* var. *bicolor* (red and primrose), *aethiopica* var. *vittigera* (orange-red), *paniculata* (red and yellow), *quadrangularis* (red and yellow), *steingroveri* (red), *schweinfurthii* (red and yellow) and *bucherveldii* (greenish-yellow). Seeds and corms of *A. intermedia* are available at present for exchange. It is known that it is particularly useful for southern California, and it may be that it will thrive also in southern Arizona, Texas, Louisiana, Mississippi, Alabama and Florida.

ROOT MEALYBUGS ON PHOENIX AND CORDYLINE

HAMILTON P. TRAUB, *California*

When the writer took possession of his home at La Jolla, Calif., in 1954, the grounds were literally overrun with giant *Eucalyptus* and in addition there were two large *Phoenix dactylifera*. All of these, as reported by neighbors had been planted by a nurseryman friend of Lew Ayres on the premises at the time his parents built the house. The *Eucalyptus* were removed at an expense of $800 and one of the *Phoenix dactylifera* was allowed to stand. It was soon found however that the roots of the palm had literally penetrated the ground for a radius of over 30 or more feet, and to a considerable depth. It was also found that *hardly anything could compete* with the roots of the palm. Also he was shocked to note that the roots were infested with mealybugs which appeared not to harm the development of the palm. Thus the palm had to be removed. In southern California such palms, and also *Washingtonia* palms, and others, serve as homes for rodents. When the *Phoenix* was removed, it was difficult to drive off the huge rats that it housed; one very large rat simply moved to the other side when workmen were busy on one side.

In this connection the writer remembered that when he resided at Orlando, Fla., in the 1930's and 1940's, it was proposed to organize a palm society. The writer noted that palms were hardly subjects for the intimate gardener, mainly due to the great size of many palms, and that their culture was best reserved for large parks and plantariums

(arboreta). Someone suggested instead that the American Amaryllis Society be organized, and this proposal luckily prevailed.

The writer ordered stock of what is locally known as the Ti plant in Hawaii, which is *Cordyline terminalis* from tropical Asia. This thrived here and soon became so luxuriant as to become a nusiance. Ti also harbors the root mealybugs which do not seem to harm it. Thus it too had to be eradicated.

It would be of interest to hear from other members who have had similar troubles.

FILMSTRIP SERIES: PLANT CLASSIFICATION

[The following excerpts are from a letter received July 6, 1962 from Dr. Winslow Kelley, Associate in Filmstrip Production, Encyclopedia Britannica Films, Inc., Wilmette, Illinois. Those interested in this cooperation should write directly to Dr. Kelley.]

It occurred to us here at Encyclopaedia Britannica Films that members of the American Plant Life Society may have in their files some excellent 35 mm color slides which could be of value for teaching young people more about botany in numerous high school classes throughout the country.

For your information, we plan to release a series of nine science filmstrips on PLANT CLASSIFICATION to the nation's high schools, this autumn. For this program we will be able to utilize 35 mm color slides for the illustrations. The subject areas for these filmstrips are:

How Plants Are Classified
Algae
Bryophytes
Fungi and Slime Molds
Bacteria
Ferns and Fern Allies
Gymnosperms
Monocotyledons
Dicotyledons

Professors Howard Arnott and Robert Doyle, botanists at Northwestern University, are the educational collaborators for this series.

Since the filmstrips will be distributed to high school biology teachers, we plan to present an over-view of the typical plants in the primary groupings. Professors Arnott and Doyle have prepared the attached list of some of the visuals still needed. Even so, if you or a member have a slide that is not identical to one requested but is closely related, substitutions will be given careful consideration.

If you or members in the Plant Life Society would be interested, we would appreciate it if 35 mm color slides on any of the subjects listed could be forwarded to us; we will purchase those accepted at $10 per slide. In addition to the $10, we will supply a duplicate of each slide purchased. Of course, those slides not used will be returned. Each slide submitted should be well identified either on the slide or on a separate identification sheet.

[For those members interested in the amaryllids, it should be noted that these are included under the heading "Monocotyledons."
—*Editor*]

PLANT LIFE LIBRARY

STUDIES IN GENETICS, by H. J. Muller. Indiana University Press, Bloomington, Indiana. 1962. Pp. 618. $4.95. Geneticists in particular and indeed all biologists are fortunate that two of the pioneer contributors, and distinguished elder statesmen in these disciplines have consented to republish their more important papers in single volumes. Prof. E. B. Lewis has assembled and edited the works of Prof. A. H. Sturtevant. Likewise, at the instigation of his students and colleagues, and on the occasion of his seventieth birthday, Prof. H. J. Muller has selected and edited the papers in the volume under review. He has also clarified certain obscurities by inserting a number of explanatory notes at appropriate spots in the text.

The papers are segregated into 9 parts; each part represents work that is roughly homogeneous in subject matter. They are: (1) Chromosome basis of heredity and linkage; (2) Genotype-phenotype relations; (3) Gene theory; (4) "Spontaneous" gene mutations; (5) Gene mutations induced by radiation; (6) Chromosome properties and changes; (7) Heterochromatin; (8) Evolution; (9) Human and general genetics.

There is a FOREWORD by Joshua Lederberg; a page devoted to "H. J. MULLER AS A TEACHER" by G. Pontecorvo; and a chronological list of "WORKS BY H. J. MULLER" which runs to 336 titles, truly a prodigious output by any set of standards. There is also an INDEX of about 8 pages. A random sample of several entries in the INDEX suggests it is accurate and usable.

Browsing thru the pages of this book, one cannot help but be impressed, or even overwhelmed, by Prof. Muller's fertile imagination, and capacity to design critical experiments. These are his most outstanding characteristics as pointed out by Pontecorvo in his essay on Muller as a teacher. It is also true as Lederberg states in the FOREWORD that Prof. Muller has had the foresight and skill to anticipate nearly all of the major advances in genetics over the past 30 years. This is truly an amazing feat in a dynamic science such as genetics has proved to be in the 60 years of the twentieth century.

Prof. Muller takes a dim view of the idea currently fashionable in some circles that all biological problems can be solved by biochemical and biophysical methods and techniques. In his opinion the methodologies and materials of classical genetics are clearly not passé. In a bold statement quoted below, Prof. Muller makes his position clear.

"We do not wish to imply by the above remarks any agreement on our part with the adolescent notion that genetic work utilizing the older methods and materials is no longer worthwhile. There are enormous areas of great importance still to be explored that cannot at present be inquired into as well in any other way, and that promise rewarding results. Included here are work on mechanisms of segregation, crossing over, mutation, position effect, gene expression, selection, and speciation, and analyses of differentiations within chromosomes and within 'loci'."

His fellow geneticists and future generations of geneticists and biologists have reason to be grateful to Prof. Muller for making available in one volume the fruits of a lifetime of research. Lastly, the Indiana University Press deserves congratulations for publishing a book of slightly over 600 pages that can be purchased for the price of $4.95.—*Thomas W. Whitaker.*

KURZE GESCHICHTE DER GENETIK BIS ZUR WIEDERENTDECKUNG DER VERERBUNGSREGELN GREGOR MENDELS [A short history of genetics up to the rediscovery of Gregor Mendel's laws] by Hans Stubbe, Gatersleben. Veb Gustav Fischer, Verlag, Jena. 1963. pp. 232. DM 18.10. Illus. Contrary to expectation there is no really good early history of genetics in the German language. This state of affairs no longer exists. Prof. Dr. Hans Stubbe, the able and respected Director of the Institutes für Kulturpflanzenforschung at Gatersleben, East Germany, has effectively closed this gap. His short history of genetics is an excellent chronicle of the early history and development of the science of heredity. Prof. Stubbe's book covers approximately the same material and time span as Conway Zirkle's "The beginnings of plant hybridization", combined with his later paper. "The knowledge of heredity before 1900". The book by Prof. Stubbe is more comprehensive than Zirkle's work because it traces developments in both plant and animal fields.

Prof. Stubbe commences his story with the domestication of animals and plants, and terminates it with a detailed, documented study of the personalities and events leading to the rediscovery of Mendel's laws in 1900. In the intervening pages he evaluates the contributions of the Greeks, the Romans and the outstanding natural history investigators of the Middle Ages. In the eighteenth century he explores the ideas and personalities responsible for the preformation theory, the theory of epigenesis and the great botanical discoveries made at the end of the seventeenth and beginning of the eighteenth centuries. The remainder of the book is devoted to the work of individuals whose investigations indirectly led to establishing a firm foundation for the recognition of the significance of Mendel's work when it came to light in 1900.

It is a scholarly book with much detailed historical information to offer the serious student of heredity. Among its most pleasant features are the excellent portraits of many of the individuals involved in the slow but steady climb of genetics from an art to a full-fledged scientific discipline. The portraits range from that of the Greek physician, Hippocrates, to the Austrian geneticist, Erich von Tschermak-Seysenegg. There is a bibliography of about 400 titles, and both a subject and author index.—*Thomas W. Whitaker.*

THE ARCHITECTURE OF THE GERMPLASM by Verne Grant, John Wiley & Sons, Inc., New York. 1964. pp. 236. $9.75. Illus. If we accept the dictionary definition of "architecture" as any ordered arrangement of the parts of a system, the title of this book is technically correct. An even more descriptive title might be, "Gene action and interaction in diploid organisms". The book is predominantly about genes, their linkages, interaction with other genes and with the environment. Within the limits he has set for himself, Prof. Grant has done a magnificent job of analysis to show just how genes are arranged and how they perform to execute their many functions. Admittedly the term "gene" is hard to define satisfactorily in terms of a precise well-marked entity on the chromosome. Grant takes the attitude the term is still a useful one. He states, "It (the gene) can only be used in an indefinite sense to refer to genetically active regions of varying size and limits on a chromosome."

Later in the book Grant suggests that the true theory of the gene will have to be established by future research, and will probably consist of a composite of several different generalizations, each with limited validity. This position is well summarized by the following quotation, "Thus the genetic material of viruses and bacteria may consist to a considerable extent of interchangeable nucleotide pairs, while that of plants and animals may be organized to a much greater extent into large structural units. In short, discrete Mendelian genes may be a characteristic element in the genotype of complex organisms, but may be a relatively uncommon feature of the genotype of simple viruses and bacteria."

Considering that the book is aimed at an audience of advanced biology students and professional biologists, one might question the propriety of including the elementary material of the first two chapters, "The Hereditary Material" and "Gene Action". Similar discussions can be found in many of the modern textbooks of genetics. As Grant points out, however, this basic material is needed for an orderly development of the analysis which follows.

It is difficult to find much to quarrel with in this book. The final 4 chapters are particularly good: "Organization of a Chromosome Region"; "Linkage of Functional Gene Systems, I"; "Linkage of Functional Gene Systems, II"; and "Linkage of Adaptive Gene Combinations". Prof. Grant has made an effort, largely successful, to avoid technical terms, but in the end he is forced to coin a few himself, e.g. serial gene systems, etc. However, one should not be misled into thinking this is a book for a casual evening's entertainment. Close attention and study are required to follow the author's skillful, tightly knit arguments.

Prof. Grant is not one of those people who think that genetics commenced in 1953 when Watson and Crick announced the probable structure of the DNA macromolecule. He has borrowed freely from earlier literature for examples that

are pertinent for his purpose. The work of Goodspeed and Avery with trisomics in *Nicotiana* is used to illustrate genic balance. Likewise, to show the differences between closely related species in the segmental arrangement of chromosomes, Avery's work with *N. alta, N. langsdorffii* and *N. bonariensis* is cited. These researches were all published in the late 1930's.

In a section on "hereditary determinants in the cytoplasm", Grant devotes about 4 pages to a succinct account of the important research of Michaelis with *Epilobium*. This work has been either ignored or not well-understood by most contemporary writers. It is a welcome surprise to see it integrated with other research on the nature of the hereditary factors in the cytoplasm.

The book is neatly assembled and printed. Moreover, it is practically free of typographical errors. The bibliographical footnotes are an unusual and convenient feature of the book. They do away with annoyance of having to turn to the end of the chapter or the rear of the book to check the author's documentation. There is a Bibliography of about 250 titles, an Author and a Subject Index—*Thomas W. Whitaker*

DIE GENOMMUTATIONEN (PLOIDIEMUTATIONEN), by Dr. Rigomar Rieger. Gustav Fischer Verlag, Jena. 1963. pp. 183. DM, 23.90. Die Genommutationen (Ploidiemutationen) is another excellent review in the series, Gundlagen, Ergebnisse und Probleme der Genetik, edited by Professor Dr. Hans Stubbe of Gatersleben, East Germany. Rieger has centered this review mostly around a discussion of the origin of polyploids and the mutations that occur in these organisms with extra chromosomes. Naturally, nearly all of the examples chosen for discussion are from the higher plants, because this is where polyploidy commonly occurs, and where it can be readily induced for experimental study. There is, however, some discussion of polyploidy in salamanders, and of aneuploidy in man. Die Genommutationen is a very thorough, well-illustrated review of 183 pages. There is a bibliography of nearly 500 titles and an author-subject index.—Thomas W. Whitaker.

GENETICS, by I. H. Herskowitz. Little, Brown and Company, 34 Beacon St. Boston 6, Mass. 1962. Pp. 466 plus 76 pp. Supplement, Illus. Professor Herskowitz's text is patently one of the best of the current crop of college textbooks on modern genetics. If the author's directions are followed it can be used for either a one semester course (31-45 hours) or a two semester course (60-90 hours). For the one semester course he suggests omitting about one-half of the material leaving only the chapters on basic concepts to be mastered.

It is an attractive book; the paper, printing, and binding are good, and the illustrations appear to have real merit. Few typographical errors are apparent. There is both a SUBJECT INDEX and an AUTHOR INDEX, along with a SUPPLEMENT. The first paper in the SUPPLEMENT is a portion of Mendel's letter of 1867 to Carl Nägeli reporting the results of his classical experiments with peas. The remainder of the material consists of Nobel Prize lectures by Morgan, Muller, Beadle, Tatum, Kornberg and Lederberg. These inspiring addresses are of lasting value, and the serious student of genetics could well take the time to study and digest them.

The author, evidently an experienced teacher, has introduced some sound pedagogical tools each calculated to stimulate the learning process. For example, each chapter terminates with a short paragraph or two, appropriately labeled SUMMARY AND CONCLUSIONS which epitomizes the essential ideas developed in the preceding pages. Also at the end of each chapter there is a list of thought provoking QUESTIONS FOR DISCUSSION, and 4 to 6 REFERENCES to original papers from which the material in the chapter was drawn. Another lively innovation is a photograph of an individual who has made significant contributions to the field covered by the chapter. It is a pleasant surprise to note that more than one half of these persons are alive today.

In 49 chapters Professor Herskowitz has covered the entire field of genetics from segregation to genetic coding. Inevitably some subjects are given more

thorough treatment than others. The text appears to be well adapted to satisfy the needs of those students majoring in science. Whether it would be suitable for liberal arts students with a limited background in chemistry and biochemistry is questionable. Also, as the author admits, the vast field of applied genetics has been almost entirely neglected.—*Thomas W. Whitaker*

A SOURCE-BOOK OF BIOLOGICAL NAMES AND TERMS, 3rd edition, revised and enlarged, 3rd Ptg., by E. C. Jaeger. Chas. C. Thomas, 301-327 E. Lawrence Av., Springfield, Ill. 1962. Pp. xxxv + 323. Illus. $5.75. Since the publication of the 3rd edition in 1955, the supplement to this standard work has been considerably enlarged. In the introductory section, the building of names and terms, types of names, application of names, transliteration, Greek prefixes, form of Latin nouns and adjectives, Latin names of anatomical structures, and language abbreviations, are considered. In the main body of the book, and supplement, the Greek, Latin, or other origins of the more than 12,000 elements included are set down alphabetically. Their meanings together with examples of their use in nomenclature and terminology, are concisely given. This is required as a standard reference book by students, teachers, and all other workers in the biological sciences. Highly recommended.

BIOLOGY TEACHER'S HANDBOOK, by J. J. Schwab, supervisor. John Wiley & Sons, 605 3rd Av., New York 16, N. Y. 1963. Pp. 585. Illus. $7.00. This is one of the series of Biological Sciences Curriculum Studies initiated by the American Institute of Biological Sciences. Thirteen authorites participated in this study and the results are summarized by the supervisor. It is intended as an everyday reference source for those teaching the Biological Sciences Curriculum Study courses, and also for those teaching other biology courses. Section 1 is devoted to the method of approach; Section 2, to the demonstration of the teaching of biology by inquiry; Section 3, to basic knowledge in the physical sciences and statistics, and recent biochemical discoveries, necessary for teaching biology; and Section 4, to information and materials which assist the teacher. This is required reading by all biology teachers, and should be on hand for daily reference. Highly recommended.

FATTY ACID METABOLISM IN MICROOGANISMS, by Klaus Hofmann. John Wiley & Sons, 605 3rd Av., New York 16, N. Y. 1963. Pp. 78. Illus. $3.25. This is a summary of the work carried on by Dr. Hofmann at the University of Pittsburgh in 1947 which was presented as the 1962 Squibb Lectures on Chemistry of Biological Products. Chapter 1 deals with lactobacillic acid, a novel microbiological metabolite; Chapter 2 is devoted to biosynthesis of cyclopropane fatty acids, and Chapter 3 is concerned with biosynthesis of monounsaturated fatty acids by microoganisms. Highly recommended.

NAMING THE LIVING WORLD, by Theodore Savory. John Wiley & Sons, 605 3rd Av., New York, 16, N. Y. 1963. Pp. 128. Illus. $3.95. This well-written, easily readable book is designed for the student in biology who desires to obtain an understanding of the principles and procedures for the naming of lineages (species and higher taxa). Part 1 is devoted to the principles of nomenclature; Part 2, to the various codes of nomenclature; and Part 3, to the practice of nomenclature—the naming of species and higher taxa.

QUANTITATIVE CHEMICAL TECHNIQUES OF HISTO- AND CYTOCHEMISTRY. Vol. 2. Interscience Publ. (Div. of John Wiley & Sons), 605 3rd Av., New York 16, N. Y. 1963. Pp. 513. Ilus. $15.75. This is the second volume in the series by Dr. Glick. The reader is referred to the review of Vol. 1 in Plant Life, vol. 19. 1963. The second volume is devoted primarily to chemical techinques—spectrophotometric and titrimetric techniques—but flame photometric, and microbiological techniques are also included. This up-to-date text is required as a constant reference companion by all who are interested in histo- and cytochemistry. It is highly recommended.

OUTLINES OF BIOCHEMISTRY, by E. E. Conn and P. K. Stumpf. John Wiley & Sons, 440 Park Av., So., New York 16, N. Y. 1963. Pp. 391. Illus. $8.75. This outstanding new one semester course in biochemistry for upper-division under-

graduates and first-year graduate students, by two authorities, will be welcomed by both the teacher and the student. It provides an excellent over-all survey of the science of biochemistry in the light of recent advances in our knowledge. Part 1 deals with the chemistry of biological compounds; Part 2, surveys the metabolism of biological compounds; and Part 3, is concerned with integration of metabolism. Appendices are devoted to buffer and pH problems; a review of some modern concepts in organic chemistry; and methods in biochemistry. The authors are to be congratulated on an excellent text. It is highly recommended.

THE CHEMISTRY OF WOOD, edited by B. L. Browning. Interscience Publ. (Div. of John Wiley & Sons), 605 3rd Av., New York 16, N. Y. 1963. Pp. 689. Illus. $25.00. This important new text by 17 authorities, includes contributions on the outstanding features of the chemistry of wood, and its components. It is intended for the student, the young scientist and technologist. It provides critical surveys of the supply and uses of wood; structure of wood; composition and chemical reactions of wood; cellulose; hemicelluloses; wood lignins; extraneous components of wood; chemistry of developing wood; wood-water relationships; manufacture of wood pulp; wood as a chemical raw material; and chemistry of bark. This contribution is both a text and a reference book and is highly recommended.

ADVANCES IN ENZYMOLOGY, AND RELATED SUBJECTS OF BIOCHEMISTRY, edited by F. F. Nord. Vol. 25. Interscience Publ. (Div. John Wiley & Sons), 605 3rd Av., New York 16, N. Y. 1963. Pp. 565. Illus. $15.00. This volume includes contributions from 15 outstanding authorities. The topics covered include elementary steps in enzyme reactions; photosynthesis, energetics and related subjects; the chemistry of light emission, the prevelance and significance of the products; inhibition of enzymes; coenzyme Q; multiple forms of enzymes; biological basis for ethionine effects on tissues; biological methylation; recent developments in the biochemistry of amino sugars; and the mechanism of cacao curing. This important volume is highly recommended to all who are interested in enzymology.

ADVANCES IN PEST CONTROL RESEARCH, edited by R. L. Metcalf. Vol. 5. Interscience Publ. (Div. John Wiley & Sons), 605 3rd Av., New York 16, N. Y. 1962. Pp. 329. Illus. $13.50. This volume includes contributions from 6 outstanding authorities in the field of pest control. The articles are devoted to the impact of antibiotics upon plant disease control; theory and principles of soil fumigation; fumigation of food commodities for insect control; gas chromatography of pesticides; and instrumentation in pesticide residue determinations. This timely book will be of interest to all who are interested in advances in the basic knowledge of plant and animal pests, and measures for their control. Highly recommended.

PROCEEDINGS OF THE FOURTH CELLULOSE CONFERENCE, edited by R. H. Marchessault. Interscience Publ. (Div. John Wiley & Sons), 605 3rd Av., New York 16, N. Y. 1963. Pp. 548. Illus. $22.50. This symposium includes contributions from a large number of authorities in the Cellulose Research Institute. It is notable that a half-day session was devoted to the molecular architecture of wood. According to prominent workers in this field, the future of cellulose as a polymeric entity is locked in the molecular complexity of wood. In addition, there are general papers on various topics usually considered at the conference; discussions on future trends in cellulose research; and contributions from friends and colleagues of P. H. Hermans. Highly recommended.

HEREDITY AND DEVELOPMENT, by J. A. Moore. Oxford Univ. Press, 417 5th Av., New York 16, N. Y. 1963. Pp. 245. Illus. (Paperback) $1.95. In the first part of the book, the history of genetic concepts is traced from Darwin's untenable theory of pangenesis of 1868, to the rediscovery of Mendelism in 1900, and finally to the identification of nucleic acid with the genetic code. In the second part—concerned with embryology—the carrying out of the hereditary instructions contained in the zygote is discussed. The subject is amplified by the consideration of a synopsis of development of the amphibian embryo; gastrulation and organ formation; differentiation; and developmental control of genetic systems. This stimulating book is highly recommended.

CHROMATOGRAPHY, edited by Erich Heftmann. Reinhold Publ. Corp., 430 Park Av., New York 22, N. Y. 1961. Pp. 753. Illus. $17.50. This first complete reference book on the theory, techniques and applications of chromatography and electrochromatography will be welcomed by all chemists and biologists. The book includes contributions from thirty-four outstanding authorities. The first part is devoted to fundamentals of chromatography including the development of theories and techniques. Part 2 is concerned with the applications of chromatography to important classes of compounds—amino acids, peptides, proteins, lipids, terpenes, carotenoids, fat-soluble vitamins, steroids, carbohydrates and related compounds, alkaloids, nucleic acids and related substances, chlorophylls and porphyrins, water-soluble vitamins, antibiotics, phenols, inorganic ions, nonhydrocarbon gases, and hybrocarbons. This important reference text is highly recommended to teachers and students; and chemists and biologists.

VIEWPOINTS IN BIOLOGY, NO. 1. Edited by J. D. Carthy and C. L. Duddington. Butterworth Inc., 7235 Wisconsin Av., Washington 14, D. C. 1962. Pp. 290. Illus. $14.95. It is refreshing to note that the series of reviews, of which this is the first, are to be written so as to be "readily understandable to other scientists as well as biologists." In this first volume, comprehensive reviews are presented by H. E. Street, on the physiology of roots; P. R. Lewis, on histochemistry in biology; H. Tristram, on protein synthesis in micro-organisms; C. L. Duddington, on predaceous fungi and the control of eelworms; J. E. Treherne, on the physiology of absorption from the alimentary canal in insects; and, Gabriel Horn, on some neural correlates of perception. This important volume is highly recommended to biologists.

THE BOXWOOD BULLETIN, Vol. 1, Nos. 1—3; Vol. 2, nos. 1—4. (1961-1962). The American Boxwood Society, Blandy Farms, Boyce, Va. Membership $2.00 per annum; Bulletin to non-members, $5.00 per volume. This quarterly is devoted to boxwood, the oldest garden ornamental. This publication will appeal to the large number of gardeners who are interested in boxwood.

LIFE: ORIGIN AND DEVELOPMENT, by Goesta Ehrensvaerd. Univ. of Chicago Press, 5750 Ellis Av., Chicago 37, Ill. English edition. 1962. Pp. 164. Illus. $1.50. This book, by an outstanding Swedish biochemist, presents his ideas about the origin of living things through gradual chemical evolution. He apparently discounts the role of chance in the evolutionary process, and holds that there is an inevitable path. However, the truth apparently lies somewhat between these two extremes. This presentation is recommended to the student as the conclusions reached by an eminent biochemist which are worthy of consideration.

THE ECOLOGY OF NORTH AMERICA, by V. E. Shelford. Univ. of Illinois Press, Urbana, Ill. 1963. Pp. 610. Illus. $10.00. This important book details an ecological reconstruction of early North America (1500 to 1600) on the basis of widely scattered published works dealing with these primeval communities, and also data collected by the author during a lifetime of field observation and research. Its publication is indeed an important event because it provides background information on the habits, biotic communities, and distribution and abundance of animals and plants in primeval North America. This outstanding book will appeal to plant and animal biologists, agriculturists, foresters, wildlife managers, and sportsmen. Highly recommended.

MOLECULAR EQUILIBRIUM, by P. H. Carnell and R. N. Reusch. W. B. Saunders Co., W. Washington Sq., Philadelphia 5, Penna. 1963. Pp. 217. Illus. Paperback, $2.25. This is a programmed course in general chemistry. The authors point out that such a course is not a substitute for regular class-room instruction, but when properly used in conjunction with the other teaching procedures, it can be of real assistance to the student. The course is in three parts—the law of chemical equilibrium; equilibrium changes; and equilibrium calculations. Highly recommended to chemistry students.

(CONTINUED on page vi, above.)

THE AMERICAN PLANT LIFE SOCIETY

For the roster of the general officers of the Society, the reader is referred to the inside front cover of this volume.

I. THE AMERICAN AMARYLLIS SOCIETY

[Affiliated with the American Plant Life Society]

[AMERICAN AMARYLLIS SOCIETY, continued from page 2.]

(c) REGISTRATION OF PLANT NAMES

Registrar: Mr. W. D. Morton, Jr., 3114 State St. Dr., New Orleans, 25, La.

Mr. Edward F. Authement, Asst. Registrar, 2214 Gallier St., New Orleans 17, La.

Mrs. Emma D. Menninger, Asst. Registrar, 700 North Old Ranch Road, Arcadia, Calif.

Correspondence about the registration of plant names should be sent directly to Mr. Morton, and a self-addressed, stamped envelope should be enclosed if a reply is expected.

(d) AMARYLLID SECTIONS

GENERAL AMARYLLID SECTION

GENERAL AMARYLLID COMMITTEE—MRS. PAUL A. KANE, *Chairman*, *1001 McIlvaine St., San Antonio 1, Texas*

Miss Elaine Brackenridge, *Texas*
Mrs. B. E. Seale, *Texas*

AMARYLLIS SECTION

AMARYLLIS COMMITTEE—DR. ROBT. G. THORNBURGH, *Chairman*, *517 Professional Bldg., Long Beach 2, Calif.*

Col. Russell S. Wolfe, *South Carolina*
Mr. Thomas R. Manley, *Vermont*
Dr. Hamilton P. Traub, *California*
Mr. Wyndham Hayward, *Florida*
Mr. Armyn Spies, *Illinois*
Mr. J. F. Stewart, *California*

THE NATIONAL AMARYLLIS JUDGES COUNCIL

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CATALOG OF HYBRID AMARYLLIS CULTIVARS 1799 TO DEC. 31, 1963

COMPILED BY

Dr. Hamilton P. Traub
Prof. W. R. Ballard
Mrs. La Forest Morton
Mr. W. D. Morton, Jr.
Mr. E. F. Authement

FIRST EDITION

THE AMERICAN PLANT LIFE SOCIETY
Box 150, La Jolla, California

Published as a supplement to PLANT LIFE, Vol. 20. 1964

FOREWORD

The registration of Hybrid *Amaryllis* clones began with the organization of the AMERICAN AMARYLLIS SOCIETY in 1934. In the same year the writer published the first catalog of Hybrid *Amaryllis* in THE AMARYLLIS YEAR BOOK. Since 1934, the Society has provided a registration service, international in scope, for *Amaryllis* and the other amaryllids.

During the 1940's the responsibility for the registration of hybrid *Amaryllis* clones was assumed by Prof. W. R. Ballard of Hyattsville, Maryland. When Prof. Ballard died in the 1950's, the post was vacant until the duties were taken over by Mrs. La Forest Morton of New Orleans, Louisiana, who ably handled the project until her death on Oct. 28, 1955. Mr. W. D. Morton, Jr., had assisted his wife in the registration and other work that Mrs. Morton had carried on as an officer of THE AMERICAN AMARYLLIS SOCIETY, and it was natural that he should continue the registration project, and he has headed up the project since that date. In 1962, Mr. Edward F. Authement accepted the position of Assistant Registrar in order to assist Mr. Morton with the project. With this additional assistance, it was decided to prepare the present CATALOG OF HYBRID AMARYLLIS CULTIVARS. Mr. Authement performed the major part of the work in connection with the compilation of the Catalog from the records left by the previous registrars.

The first Amaryllis hybrid was made by a Mr. Johnson, who had a small garden at Prescot, Lancastershire, England. The hybrid was reported in 1799. It was a cross between *Amaryllis reginae* and *A. vittata*, and was later named *Amaryllis* x *johnsonii*. This, or similar hybrids, has come down to us. During the first third of the 19th century, many hybrid *Amaryllis* had been produced, mainly in England.

Hybrids in the contemporary sense were first produced by Garroway & Company, of Bristol, England, who originated *Amaryllis* x *acramannii* in 1835 by crossing *Amaryllis aulica* var. *platypetala* and *A. psittacina*. This hybrid has come down to us and is still cultivated in the United States.

The second important step in the development of the larger-flowered hybrids was realized when Jan de Graaff (1797—1862) crossed *A. vittata* with *A. striata* vars. *fulgida* and *crocata*, and by selective breeding obtained the colorful hybrid which was named 'Graveana'.

His son, Simon de Graaff (1840—1911) in the 1860's crossed *A. psittacina* and *A. striata* with other available larger-flowered hybrids, and then crossed these with 'Graveana', and thus produced the famous 'Empress of India', with glowing red flowers and broad, rounded, white-banded telapsegs. This represented the third landmark because it was the beginning of the large-flowered Reginae hybrids represented today by Division 4-A and 4-B Reginae flower types.

The fourth step in the direction of the contemporary hybrids was taken when Richard William Pearce was employed by Veitch & Sons to collect plants in South America. He brought back *Amaryllis*

leopoldii and *A. pardina* from Peru (possibly actually from Bolivia). These were crossed with the best Reginae hybrids and by the 1870's gave rise to the large-flowered, open-faced Leopoldii hybrids. These are recognized today as Division 5-A and 5-B Leopoldii Hybrids.

The contemporary hybrids contain genes not only of the species mentioned but also of a number of others—a total of more than a dozen species.

With the organization of THE AMERICAN AMARYLLIS SOCIETY in 1934, steps were taken to extend the variety in cultivated hybrid *Amaryllis*. In addition to Reginae Hybrids (Division 4-A and 4-B), and Leopoldii Hybrids (Division 5-A and 5-B), the following new Divisions were recognized: Division 1 (cultivated wild species); Division 2 (Long Trumpet Hybrids), Division 3 (Belladonna Hybrids), Division 6 (Orchid-flowering Hybrids), Division 7 (Double Hybrids), Division 8 (Miniature Hybrids) and Division 9 (Unclassified Hybrids). Some progress has been made toward popularizing these additional types which add much needed variety.

Since 1799, a very great many *Amaryllis* hybrids have been produced and named. Of these, up to 1934, only a very few had survived. It would thus serve no useful purpose to attempt to catalog all of these names of non-existent clones. It was decided to list only those names which had appeared in major works concerned with *Amaryllis*. Such a catalog was prepared by the present writer and published in the 1934 AMARYLLIS YEAR BOOK. Beginning with this date, an attempt was made to catalog at least the named clones in commerce. These names were listed as registered in the AMARYLLIS YEAR BOOK. The present Catalog includes these names and those registered up to December 31, 1963. This work is to be considered as *the starting point* for the nomenclature of hybrid *Amaryllis* cultivars.

Supplements to the present Catalog will be issued from time to time, listing those named clones in cultivation. Thus, those interested may keep up with developments by consulting the 1964 Catalog, and the most recent supplement.

Camino de la Costa,
La Jolla, California
Decembed 31, 1963

Hamilton P. Traub,
Editor

CORRIGENDA

Any needed corrections in the CATALOG will be reported in PLANT LIFE 1965.

HOW TO REGISTER AN AMARYLLIS CLONE

The registration service, international in scope, was instituted by The American Amaryllis Society in 1934.

1. Write to the Registrar of *Amaryllis* cultivar names, Mr. W. D. Morton, Jr., 3114 State Street Drive, New Orleans 25, La.; or Mr. Edward F. Authement, Assistant Registrar, 2214 Gallier Street, New Orleans, La. 70117, for registration blanks, enclosing check or money order for the registration fee made payable to THE AMERICAN AMARYLLIS SOCIETY, which is affiliated with THE AMERICAN PLANT LIFE SOCIETY.

2. The registration fee is $2.00 for each clone registered. The brief description of the registered clone will be published in the next following AMARYLLIS YEAR BOOK.

3. A name not previously used should be selected, and this together with an alternate name that may be substituted in case the first has already been pre-empted. The present Catalog contains all of the names pre-empted through 1963. If it does not appear there, or in any Supplement published later, the chances are that it is available unless some one has recently sent in an application with a request for it. The registration is not completed until the blanks are filed and approved by the Registrar. A signed registration form will then be returned to you.

4. The registration procedure is in essential accordance with the International Code for Cultivated Plants, 1961 or later editions. Names should consist preferably of one or two words, and never of more than three words. The following types of names are inadmissible:

(a) Scientific or common names of a genus, or the common name of a species; such as 'Hibiscus', 'Camellia', 'May Apple', etc.
(b) Numerals or symbols such as seedling numbers, etc.
(c) Names beginning with articles, such as "The" and "A".
(d) Names of living persons without the written consent of that person, or of the parents, in case of a minor.
(e) Abbreviations such as "Dr." for "Doctor", "Mt." for "Mount", etc.
(f) Use of trademark or copyrighted names unless previously in common use. Or a slight variation of a name already registered

5. The application blank should be filled in as completely as possible. It is particularly important to include (a) the flower type Division, (b) the height of the plant; (c) number of flowers per umbel; (d) depth of flower; (e) diameter of the flower; (f) brief color description of flower; (g) flowering time; (h) deciduous or evergreen habit of plant.

6. The classification of the Amaryllis flower types are those which appear in Traub, "The Amaryllis Manual". Macmillan Co., New York & London, 1958:

Division 1. Cultivated Wild Amaryllis (D-1)
Division 2. Long-Trumpet Amaryllis Hybrids (D-2)
Division 3. Belladonna-Type Amaryllis Hybrids (D-3)
Division 4. Reginae-Type Amaryllis Hybrids (D-4) (sub-types D-4A, and D-4B)
Division 5. Leopoldii-Type Amaryllis Hybrids (D-5) (sub-types D-5A, and D-5B)
Division 6. Orchid-Flowering Amaryllis Hybrids (D-6)
Division 7. Double Amaryllis Hybrids (D-7)
Division 8. Miniature Amaryllis Hybrids (D-8)
Division 9. Unclassified Amaryllis Hybrids

7. Introduction of hybrid Amaryllis clones: Introduction is defined as the "offering for sale to the public" in catalogs, printed lists, and advertisements. Send copies of these, if they contain new introductions, to the Registrar, if possible.

8. Only registered named clones, and authentic unnamed breeder's seedling, are eligible for the regular awards at Official Amaryllis Shows.

ALPHABETICAL LIST OF ABREVIATIONS—DESCRIPTIVE TERMS AND LITERATURE CITATIONS

A—The genus **Amaryllis** L., first published in Linnaeus, "Species Plantarum", 1753; used as a prefix to registration numbers: A280, etc.

AAS.—The American Amaryllis Society; organized in 1933; affiliated with the American Plant Life Society since 1945.

APLS.—The American Plant Life Society.

autm.—autumn-flowering.

Bak. Amaryll. 1888.—Baker, J. G.; Handbook of the Amaryllideae. Geo. Bell & Sons, London, 1888.

c.—trade catalog or price list.

Chitt. 1933.—Chittenden, F. J.; Royal Horticultural Society, London. Communication dated Oct. 20, 1933.

cl.—clone; a plant reproduced by asexual (vegetative) means. For example: All plants of the clone 'Floriade' are genetically uniform with the original "mother plant", having been derived from it by vegetative division. A clone is a particular kind of **cultivar** (cultivated plant).

Cult.—plants that are maintained under cultivation.

D—Amaryllis flower division. (see Registration Procedure).

dbl.—flowers double.

DCN.—The ISCC-NBS Method of Designating Colors, and a Dictionary of Color Names. National Bureau of Standards Circular #553, 1955. Order from Supt. of Documents, U. S. Printing Office, Washington 25, D. C.

dec.—deciduous: plant loses its leaves at a certain season each year, and goes dormant.

diam.—diameter: flower size across face.

e.—early: applied to spring, summer, autumn, or winter flowering season.

err.—error: due to spelling rather than a real synonym; such names are enclosed in double quotation marks.

ev.—foliage evergreen (held for a relatively long period). Younger leaves are produced before the older ones die down; such plants do have a dormant period but the leaves are not shed.

f.—figure.
fc.—figure, illustrated in color.
fld.—flowered (as per number of florets per umbel).
fls.—florets (flowers).
fr.—mildly to moderately fragrant.
GC.—Gardeners Chronicle (London).
GW.—Gartenwelt, Berlin.
GZ. Gartenezeitschrift, Berlin.
h.—height of scape in inches.
Hb.—Herbertia, Vols. 1-15 (1934-1948), includes Yearbook American Amaryllis Society, Vols. 1 and 2.
HCC—Wilson, Horticultural Colour Chart, publ. by Royal Horticultural Society, Vincent Square, S. W. 1, London, England.
Herb. Amaryll. 1837.—Herbert., William, Amaryllidaceae, James Ridgway & Sons, London. 1837.
Houd., Cat.—Houdyshel, Cecil; catalog, La Verne, Calif.
I.—Introducer, or introduced formally into commerce.
Ker. Cat.—Ker, Robert P. & Sons, Liverpool, England; catalog.
la.—late; applied to spring, summer, autumn, or winter flowering season.
l. hom.—later homonym; the term used when a name already in use has been applied to a different clone at a later date.
M & P.—Maerz & Paul, A Dictionary of Color; McGraw-Hill, N. Y.
NCF.—Nickerson Color Fan.—1957. Order from Arnold Arboretum, Jamaica Plain 30, Mass.
Nehr. Amaryll. 1909.—Nehrling, Henry, Die Amaryllis oder Rittersterne, Paul Parey. Berlin. 1909.
NR.—Not registered; recognized as validly published, but unregistered clone which has been published with adequate description. Such clones are not eligible for awards at the Official Amaryllis Shows unless they are registered later.
petseg., petsegs.—petepalseg, petepalsegs; refers to the inner floral segments.
PL.—Plant Life, Vols. 1 to date (1945 to date); includes also Year Book American Amaryllis Society from 1949 to date.
R.—Registered.
recu.—recurrent blooming; more than once each season.
RH.—Revue Horticole (Paris).
RHS.—Royal Horticultural Society, London, Journal.
seg., segs.—tepalseg, tepalsegs; refers to the floral segments.
semi-ev.—foliage semi-evergreen; intermediate.
setseg., setsegs.—Setepalseg, setepalsegs; refers to the outer floral segments.
spr.—spring flowering.
SPN. 1942—Standardized Plant Names, 2nd. ed., edited by Harlan P. Kelsey & William A. Dayton. J. Horace McFarland Co., Harrisburg, Pa. 1942.
su.—summer flowering.
Sweet—Sweet, British Flower Garden, 1830.
syn.—synonym; term used to apply to invalid names for the same clone.
Traub, Amaryll. 1958.—Traub, Hamilton P., The Amaryllis Manual. Macmillan Co., New York. 1958.
U—Umbel; flower cluster.
v. fr.—very fragrant.
Veit. RHS. 1890.—Veitch, Harry; The Hippeastrum (Amaryllis). Journal Royal Horticultural Society, London 12:243-255. 1890.
Veit. Cat.—Veitch, James & Sons; Chelsea, England. catalogs, 18— to date (1934).
win.—winter flowering.
x hybrid.

ROSTER OF AMARYLLIS HYBRIDIZERS AND/OR INTRODUCERS WITH ABBREVIATIONS

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—B—

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Nort.—Mr. J. B. S. Norton, Hyattsville, Maryland.

—O—

Ober.—Mr. P. H. Oberwetter, Texas.
O'Bri.—Mr. James O'Brien, England.

—P—

Park.—Mrs. Isabelle Parker, Biloxi, Miss.
Pat.—Mr. Bib Paterson, Australia.
Perr.—Mr. W. J. Perrin, New Orleans, La.
Pfis.—Mr. H. Pfister, Washington, D. C.
Pick.—Mrs. A. C. Pickard, Houston, Texas.
Price—Mr. Hugh Price, Australia.

—R—

Raa.—Mr. R. E. Raasch, Corpus Christi, Texas.
RBG, Kew—Royal Botanical Gardens, London, England.
Ram.—Mr. Charles Ramelli, Biloxi, Miss.
Rice—Mr. W. E. Rice, Downey, Calif.
Roths.—Mr. Lionel de Rothschild, England.

—S—

S. Afr. NH.—South African National Herbarium, Pretoria, South Africa.
Sam.—Mr. Perce Sampson, Australia.
Sang.—Mr. B. M. Sangster, Orlando, Fla.
Say.—Mr. W. S. Sayler, Sr., Fernandina Beach, Fla.
Scavia—Mr. Jack Scavia, California.
Schee.—Mr. John Scheepers, New York, N. Y.
Scher.—Messrs. Valentine Schertzer & Sons, Holland.

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Searles—Mr. Harry Searles, Orlando, Fla.
Smith, B. D.—Mr. Beckwith D. Smith, Jacksonville, Fla.
Smith, J. C.—Dr. Joseph C. Smith, La Mesa, Calif.
Sol.—Mr. Robert L. Solomon, Tampa, Fla.
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Spring.—Mr. John A. Springer, Florida.
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Ste.—Mr. Victor Stephens, Australia.
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Str.—Sir Charles Strikland, England.
Strout—Mrs. Edith Strout, California.
Sweet—Mr. Sweet, England.

—T—

Terry—Mr. J. W. Terry, Hattiesburg, Miss.
Tilg.—Mrs. W. G. Tilghman, Palatka, Fla.
Traub—Dr. Hamilton P. Traub, La Jolla, Calif.
T & H—Dr. Hamilton P. Traub & Mr. Ausher E. Hughes, Orlando. Fla.
Tress—Mr. Robert Van Tress, Chicago, Ill.
Turner—Mrs. Marie Turner, Temple City, Calif.

—U—

Ulrick—Mr. L. W. Ulrick, Brisbane, Australia.
U. S. D. A.—U. S. Dept. of Agri., Bureau of Plant Industry, Washington, D. C.

—V—

Vas.—Mr. Frank Vasku, Winter Park, Fla.
VE.—Mr. A. C. Van Eeden, Holland.
Veit. J.—Messrs. James Veitch & Sons, Chelsea, England.
V. Hou.—Mr. Louis Van Houtte, Belgium.
VM.—Messrs. G. C. Van Meeuwen & Sons, Heemstede, Holland.
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—W—

W-C.—C. Warmenhoven, Hillegom, Holland.
W-WS.—W. S. Warmenhoven, "Zonnewende", Hillegom, Holland.
W-WZ.—W. Warmenhoven & Zonen, Hillegom, Holland.
Whe.—Mr. R. W. Wheeler, Winter Park, Fla.
Will.—Mr. B. S. Williams, England.
Wolfe—Mr. Russell S. Wolfe, Orangeburg, South Carolina.
Wors.—Mr. A. Worsley, Middlesex, England.

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Zand.—Zandbergen Bros., Inc., Valkenburg, Holland.
Zeiner—Mr. G. D. Zeiner, Florida.

CATALOG OF HYBRID AMARYLLIS CULTIVARS, 1799 TO DEC. 31, 1963

The names of hybrid **Amaryllis** clones, both valid and invalid, and also a few of the cultivated wild species, are listed alphabetically. For descriptions of the wild **Amaryllis** species see Traub—The Amaryllis Manual. Macmillan Co., New York. 1958; and Plant Life for species published since 1958.

The reader should consult the list of abbreviations for the meaning of any that appear in this Catalog.

All completed registrations up through December 31, 1963 are included in the Catalog.

—A—

'Acadia', R; A-2; sulphur-colored, high-lighted and veined light red. Nehr. Amaryll. 1909. Hb. 1:46. 1934.

'Achilles', NR; Hb. 1:63. 1934.

' Acquisition' (Veit. 1889), R; A-3; Chitt. 1933. Hb. 1:46. 1934.

'Acramanii' (Garr. 1835), R; A-4; err: "acramanni", "ackermannii"; **A. aulica** var. **Platypetala** x **A. psittacina.** Nehr. Amaryll. 1909. Hb. 1:46. 1934.

'Adonis', NR; Hb. 1:63. 1934.

'Africana' (HDL. 1963), R; A-760, D-5A; U-4fld; 15″ h; fls. 6½″ diam; scarlet (HCC-19), darker throat; spr.; I.—VZ. 1963.

'African Glow' (Buller), NR; brilliantly flame colored. PL. 19:22. 1963.

'Agamemnon' (Holf. 1906), R; A-5; Chitt. 1933. Hb. 1:46. 1934.

'Agatha' R; A-773. I.—Goed. 1962 for a Dutch Breeder.

'Agneta', R; A-6; orange-red, bordered white. Nehr. Amaryll. 1909. Hb. 1:46. 1934.

'Aileen Ingle' (BM. 1962), NR; claret rose on white.

'Albaron' (VM. 1962), R; A-741, D-5A; U-4fld; 16″ h; fls. 6½″-7½″ diam; currant red (HCC-821), cardinal red throat. PL. 19:67. 1963.

'Alabaster' (Traub, 1960), R; A-553, D-5A; U-4fld; 22″ h; large pure white; spr.; dec.; PL. 16:76. 1960.

'Alba Rosea Marginata' (Ker), R; A-6, D-5; white, segs veined rose red. Nehr. Amaryll. 1909. Hb. 1:46. 1934.

'Alcyone' (VM. 1952), R; A-518, D-4A; 22″ h; fls. 7″ diam; dark red. PL. 15:46. 1959.

'Albino' (VM. 1948), R; A-517, D-4; U-4fld; 22″ h; fls. 7″ diam; pure white. PL. 15:46. 1959.

'Alec' (BM. 1954), R; A-562, D-5B; U-2fld; 16″ h; fls. 7½″ diam; capsicum red (HCC-715), currant red flush, white towards throat. PL. 17:51. 1961.

'Alexandria' (VM.), NR; blood red.

'Alfred' (Arms. 1949), R; A-7, D-5A; fls. 8½″ diam; pure white. PL. 5:88. 1949.

'Alipur Beauty' (Lanc. 1940), R; A-8, D-8; U-4fld; 15″ h; fls. 4″ diam; carmine pink, tube pale green, white bands on petals; **A. stylosa** x **A. reticulata striatifolia,** 'Mrs. Garfield'. Hb. 6:238. 1939.

'Allmanni' (Col.), R; A-9; **A. calyptrata** x **A. vittata.** Herb. Amaryll. 1837. Hb. 1:46. 1934.

'Alpha' (BM. 1954), R; A-563, D-5B; U-2-3fld; 20″ h; fls. 7½″ diam; vermilion red (HCC-18). PL. 17:51. 1961.

'Alta Clarae' (Herb.), R; A-10; **A. psittacina** x 'Griffini'. Hb. 1:46. 1934.

'Amazon' (BM. 1954), R; A-564, D-5B; U-4fld; 20″ h; fls. 7½″ diam; currant red (HCC-821), flushed white. PL. 17:51. 1961.

'Ambiguum' R; A-11. **A. elegans** x **A. vittata.** Bak. Amaryll. 1888. Hb. 1:46. 1934.

'America' (Heat. 1938), R; A-15, D-5; golden pink, cream base, whitish keel shaded pink, speckled. Hb. 5:146. 1938.

'American Beauty' (Zeiner), NR; Hb. 11:256. 1944.

'American Express' (Lud. 1951), R; A-421, D-5A; U-4fld; 26″ h; fls. 8″ diam; oriental red (HCC-819), violet red reflection. PL. 14:55. 1958.

'American Fashion' (Lud. 1954), NR; U-4fld; 26″ h; fls. 8″ diam; rose madder (HCC-23). c. Lud. 1954.

'American Idol' (Lud. 1956), NR; U-4fld; 30″ h; fls. 11″ diam; salmon (HCC-412), salmon-red throat, upper petals bearded. c. Lud. 1956.

'American Pride' (Gasp. 1964), R; A-748, D-5A; U-4fld; 16″ h; fls. 7″ diam; currant red (HCC-821), darker throat.

'Amor' (VM. 1963), R; A-742, D-5A; U-4fld; 15″ h; fls. 7″ diam; geranium lake (HCC-20/1), greenish-white midribs, stripes, PL. 19:67. 1963.

'Anagram' (BM. 1954), R; A-555, D-5B; U-2-3fld; 16″ h; fls. 7½″ diam; geranium lake (HCC-20), flushed white. PL. 17:51. 1961.

'Andersoni' (Herb.), R; A-12; **A. striata** x **A. vittata.** Hb. 1:46. 1934.

'Andromache' (Ker), R; A-13, D-5; violet red. Nehr. Amaryll. 1909. Hb. 1:46. 1934.

'Andromeda' (Ker), R; A-14, D-5; light ground with red veins. Nehr. Amaryll. 1909. Hb. 1:46. 1934.

'Anita' (Gasp. 1958), R; A-399, D-5B; U-4fld; 30″ h; fls. 7½″ diam; rose bengal (HCC-25), mid-stripe on segs; fr.; spr. PL. 14:54. 1958.

'Anna Paulowna' (W-WS. 1951), R; A-492; U-4fld; 26″ h; fls. 8″ diam; salmon-red, red throat. PL. 15:44. 1959.

'Anne Lindberg' (Dom. 1934), NR. Hb. 2:92. 1935.

'Aphrodite' (Ker), R; A-16, D-5A; white, striped and feathered red. Hb. 1:46. 1934.

'Aphrodite' (VM. 1962), R; A-743, D-5A; U-4-6fld; 16″ h; fls. 6″ diam; signal red (HCC-719), green throat, white midribs. PL. 19:67: 1963.

'Apollo' (Ker), R; A-18, D-5; carmine red, edged white. Hb. 1:46. 1934.

'Apollo' (W-C. 1962), R; A-725, D-5A; U-3-4fld; 21″ h; fls. 8″ diam; vermilion red (HCC-18); spr.; I.—Goed, 1962. PL. 19:67. 1963.

'Apple Blossom' (Holf. 1899), R; A-17; Chitt. 1933. Hb. 1:46. 1934.

'Apple Blossom' (Lud. 1954), R; A-422, D-5B; U-4-5fld; 22″ h; fls. 8″ diam; white, with dawn pink (HCC-523), lower segs lighter shade, red ring in throat; spr; dec. PL. 14:55. 1958.

'Arona', R; A-19; yellow (like Clivia yellow). Nehr. Amaryll. 1909. Hb. 1:46. 1934.

'Artemise' (Sou.), R; A-20; **A. vittata hybrid.** Nehr. Amaryll. 1909. Hb. 1:46. 1934.

'At Dawning' (BM 1954), R; A-566, D-5A; U-2fld; 14″ h; fls. 7″ diam; scarlet (HCC-19), white star in throat. PL. 17:51. 1961.

'Attraction' (Lud. 1958), R; A-457, D-5B; U-4fld; 30″ h; fls. 7½″ diam; syn: "Red Radiance", capsicum red (HCC-715), darker throat; spr; dec; PL. 15:42. 1959.

'Audrey' (Font. 1958), R; A-405, D-5B; U-4fld; 24″ h; fls. 6″ diam; rose opal (HCC-o22) greenish throat, segs reflexed; spr; ev. Mead hybrid crimson x cl. Pink Perfection. PL. 14:55. 1958.

'August Koch' (GPC 1937), R; A-21; U-4fld; orange red, pale yellowish star; syn: "Hippecoris garfieldii, no. 13". I.—AAS. 1937. Hb. 4:142. 1937.

'Aurora' (Ker), R; A-22, D5; light red, strongly veined red. Nehr. Amaryll. 1909. Hb. 1:46. 1936.

'Autumn Beauty' (Veit.), R; A-23; **A. reticulata striatifolia** x **A. leopoldii**; autm. Nehr. Amaryll. 1909. Hb. 1:46. 1934.

'Autumn Charm' (Veit.), R; A-24; **A. reticulata striatifolia** x **A. leopoldii**; autm. Nehr. Amaryll. 1909. Hb. 1:46. 1934.

'Averunicus' (Veit. 1901), R; A-25; orange red, bordered white. Nehr. Amaryll. 1909. Hb. 1:46. 1934.

'Azalea' (BM. 1954), R; A-567, D-5B; U-2fld; 24″ h; fls. 7″ diam; azalea pink (HCC-618), flushed white. PL. 17:51. 1961.

—B—

'Baby Pink' (Gasp. 1958), R; A-400, D-5B; U-4fld; 26″ h; fls. 6½″ diam; solferino purple (HCC-26/3), greenish throat; spr; fr. PL. 14.54. 1958.

'Bacchus' NR; Hb. 1:63. 1934.

'Baffin' (Sou.), R; A-26; **A. vittata** hybrid Nehr. Amaryll. 1909. Hb. 1:46. 1934.

'Baroness Schroder' (Schr. 1928), R; A-27; Hb. 1:46. 1934.

'Baron Palles' (Will.), R; A-28; cl. 'Defiance' x **A. reticulata**; autm. Nehr. Amaryll. 1909. Hb. 1:46. 1934.

'Batemanni' (Col.), R; A-29; **A. reginae** x **A. striata**. Herb. Amaryll. 1837. Hb. 1:46. 1934.

'Baton Rouge' (Lud. 1954), NR; U-4fld; 30″ h; fls. 8½″ diam; signal red (HCC-719); la. spr; c. Ludwig & Co. 1954.

'Beacon' (Whe. 1940), R; A-30, D-5A; fls. 8″ diam; red with violet tones, darker center, lighter towards edges. Hb. 7:130. 1940.

'Beacon' (W-WS. 1954), R; A-493; U-4fld; 26″ h; fls. 10″ diam; salmon. white midrib. PL. 15:44. 1959.

'Beau Joliat' (W-WS), R; A-494; 22″ h; fls. 3½″ diam; rosy red. PL. 15:44. 1959.

'Beautiful Lady' (Lud. 1963), R; A-756, D-5A; U-4fld; 26″ h; fls. 10″ diam; mandarin red (HCC-17/1/2), azalea pink influence, darker throat; spr.

'Belinda' (VM. 1963), NR; dark velvety red, darker throat. R; A-750.

'Bella Vista' (Lud. 1960), R; A-555, D-5A; U-4fld; 22″ h; fls. 8″ diam; cherry red (HCC-722/1), dark red throat. PL. 17:53. 1961.

'Bellini' (VM. 1963), R; A-783, D-5A; U-3-4fld; 16″ h; fls. 6½″ diam.; tyrian rose (HCC-24/2). Registered and I.—Goed. 1963.

'Ben Hur' (Nehr.), R; A-31; orange red; **A. belladonna** x cl. 'Empress of India'. Hb. 1:46. 1934.

'Benthamii' (Herb.), R; A-32; gloomy but variable red. Hb. 1:46. 1934.

'Berengaria' (Heat. 1938), R; A-33, D-5; soft dark pink with white star. Hb. 5:146. 1938.

'Bertha Vasku' (Vas. 1936), R; A-34, D-4B; deep red. Hb. 3:92. 1936.

'Bert Merrill' (Traub 1934), NR; Hb. 2:92. 1935.

'Besson', R; A-35; Chitt. 1933. I.—Holf. 1898. Hb. 1:46. 1934.

'Bethlehem Gem' (BM. 1954), R; A-568, D-5B; U-3fld; 20″ h; fls. 9″ diam; brick red (HCC-o16), white fusion on center of segs. PL. 17:51. 1961.

'Betty Jean' (Arms. 1945), R; A-36, D-5B; fls. 10″ diam; white, pink penciling in throat. Hb. 12:104. 1945.

'Big Chief' (Zeiner 1944), R; A-37; fls. 7″ diam; solid red. Hb. 11:266. 1944.

'Black Beauty', R; A-38; Chitt. 1933. I—Holf. 1925. Hb. 1:46. 1934.

'Black Prince', R; A-39; Chitt. 1933. I.—Holf. 1903. Hb. 1:47. 1934.

'Blazing Star' (Lud. 1958), R; A-463, D-5A; U-4fld; 22″ h; fls. 9½″ diam; dark vermilion (HCC-717), darker throat. PL. 15:42. 1959.

'Bleeding Heart' (Lud. 1954), NR; U-3-4fld; fls. 8″ diam; blood red (HCC-820). c. Ludwig & Co. 1954.

'Blushing Beauty' (W-WS. 1962), R; A-683, D-5A; U-3-4fld; 20″ h; fls. 7″ diam; rose pink (HCC-427), white on 3 upper segs, lower segs white

with orient pink (HCC-416/3). PL. 19:65. 1963.

'Bondi Beach' (BM 1958), R; A-633, D-5B; U-2fld; 19″ h; fls. 7½″ diam; shrimp red (HCC-616). PL. 17:52. 1961.

'Bon Ton' (VW 1959), R; A-653; U-4fld; 20″ h; fls. 8″ diam; carmine pink (HCC-21). PL. 17:53. 1961.

'Bordeaux' (W-WS. 1951), R; A-495; U-4fld; 28″ h; fls. 10″ diam; orange-scarlet (HCC-19), deep scarlet in throat. PL. 15:45. 1959.

'Bouquet' (Lud. 1953), R; A-424, D-5A; U-4fld; 28″ h; fls. 9″ diam; begonia rose (HCC-619-619/2), throat and stamens empire rose (o621); spr; dec. PL. 15:42. 1959.

'Boy Rolf' (Bur. 1905), NR. Hb. 9:152. 1942.

'Brenda', R; A-40. Chitt. 1933. I.—Veit. 1897. Hb. 1:47. 1934.

'Brian Boru', R; A-41. Chitt. 1933. I.—Holf. 1906. Hb. 1:47. 1934.

'Bridal Bouquet' (BM 1958), R; A-634, D-5A; U-1-3fld; 18″ h; fls. 9″ diam; light cream, pin-pointed delft rose, picotee edges. PL. 17:52. 1961.

'Bridesmaid' (Lud. 1953), R; A-423, D-5B; U-3-4fld; 24″ h; fls. 7½″ diam; pure white, greenish tinge in throat; spr; dec. PL. 15:43. 1959.

'Brilliant' (VE), NR; **A. pardina** hybrid. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Brilliant' (Lud. 1953), R; A-425, D-5A; U-4fld; 24″ h; fls. 8½″ diam; signal red (HCC-719), dark red throat; spr; dec. c. Ludwig & Co. 1954. PL. 15:43. 1959.

'Brilliant Star' (W-WS. 1962), R; A-708, D-5A; U-4fld; 20″ h; fls. 6″ diam; currant red (HCC-821) with cardinal red (822) in throat. PL. 19:65. 1963.

'Britannia' (Heat. 1938), R; A-43; light salmon, upper petals veined along keel, lower petals shaded white to pink at tips. Hb. 5:146. 1938.

'Brocade' (BM 1957), R; A-569, D-5B; U-2-3fld; 18″ h; fls. 8½″ diam; porcelain rose (HCC-620), flushed white, tips azalea pink. PL. 17:51. 1961.

'Broginart' (Sou.), R; A-1; **A. vittata** hybrid. Nehr. Amaryll. 1909. Hb. 1:46. 1934.

'Brookesi' (Bro.), R; A-44; **A. elegans** x **A. johnsonii.** Hb. 1:47. 1934.

—C—

'Calliope' (Ker), R; A-45, D-5; scarlet red, rose red sheen. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Calphurnia', R; A-46; rose, white star. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Calypso' R; A-47. Chitt. 1933. I.—Holf. 1910. Hb. 1:47. 1934.

'Camellia' (VM 1935), R; A-519, D-7; 24″ h; fls. 8″ diam; salmon rose, partially double. PL. 15:46. 1959.

'Cammack's Star' (Camm.), NR; PL. 10:79. 1954.

'Candy Cane' (Lud. 1954), R; A-426, D-5A; 28″ h; fls. 9″ diam; segs white-edged, white band in center and bright capsicum red (HCC-715/3) bands between white; spr; dec. c. Ludwig & Co. 1954. PL. 15:42. 1959.

'Cannae Butterfly' (McCul. E), NR; D-6; U-4fld; red on white ground, greenish white midribs, thickly striped and dotted red. PL. 10:27, f. 1. 1954.

'Capsicum' (BM. 1956), R; A-570, D-5B; U-2fld; 20″ h; fls. 7½″ diam; capsicum red (HCC-715), flushed white. PL. 17:51. 1961.

'Captain McCann' (McCann), NR; D-7; dark red. PL. 6:108. 1950.

'Cardinal' (Chandler), NR; SPN. 13. 1942.

'Cardinal' (Lud. 1958), R; A-464, D-5A; U-4fld; 24″ h; fls. 8″ diam; oxblood red (HCC-820), currant red throat; spr; dec. PL. 15:42. 1959.

'Cardinal's Choice' (BM. 1954), R; A-572, D-5B; U-2-3fld; 17″ h; fls. 7½″ diam; cardinal red (HCC-822). PL. 17:51. 1961.

'Cardinal Wolsey', R; A-48. Chitt. 1933. I.—Holf. 1910. Hb. 1:47. 1934.

'Cardinal Wolsey' (BM. 1954), R; A-571, D-5B; U-2fld; 14″ h; fls. 7″ diam; cardinal red (HCC-822). PL. 17:51. 1961.

'Carmen' (Whe. 1941), R; A-49, D-5A; fls. 8½″ diam; crimson, violet tones. Hb. 8:92. 1941.

'Carminata' (Ker), R; A-50, D-5; light rose red. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Carnarvoni' (Herb.), R; A-51; **A. elegans** x **a. johnsonii.** Hb. 1:47. 1934.

'Carnavonia' (de Cand.), NR; **A. reginae** x **A. vittata.** Herb. Amaryll. 1837. Hb. 1:47. 1934.

'Carolina' (BM 1957), R; A-573, D-5B; U-4fld; 18″ h; fls. 7″ diam; creamy white, flushed and nettled scarlet. PL. 17:51. 1961.

'Carolyn' (Burns 1936), R; A-52; large blood-red. Hb. 3:92. 1936.

'Carousel' (Lud. 1963), R; A-754, D-5A; U-4fld; 30″ h; fls. 9″ diam; capsicum red (HCC-715), and white.

'Cartoni' (Herb.), R; A-53; **A. aulica** x cl. 'Sweetii'. Hb. 1:47. 1934.

'Caruso' (Lud. 1950), NR; U-4fld; 24″ h; fls. 8″ diam; orange-scarlet, darker in throat. PL. 7:72. 1951.

'Casper Ludwig' (Lud. 1948), R; A-196; 24″ h; fls. 7½″ diam; pure white with slight greenish throat. Hb. 15:69. 1948.

'Cassandra' (Ker), R; A-54, D-5; red, white veins. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Cathedral Peak' (BM. 1958), R; A-574, D-5B; U-2-3fld; 20″ h; fls. 8½″ diam; blood red (HCC-820). PL. 17:51. 1961.

'Cathedral Windows' (Ram. 1959), R; A-543, D-5A; 23″ h; fls. 6½″ diam; brick red (HCC-o16) with white, light orange effect; spr; dec. PL. 16:76. 1960.

'Catherine Valente' (W-WS. 1962), R; A-688, D-5B; U-3-4fld; 23″ h; fls. 7″ diam; delft rose (HCC-o20/1), geranium lake (20) in upper segs towards throat. PL. 19:65. 1963.

'Cavalier', R; A-774. I.—Goed. 1962 for a Dutch breeder.

'Cecelia', R; A-55 white over a rose scarlet ground. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Celestine' (Hay. 1938), R; A-56, D-5; U-4fld; fls. 8″ diam; salmon coppery-pink, white keels to 1″ of tip of segs. Hb. 5:146. 1938.

'Cerise Magnificum', R; A-57. Chitt. 1933. I.—Schr. 1928. Hb. 1:47. 1934.

'Champion's Reward' (Lud. 1954), R; A-427, D-5A; U-4fld; 26″ h; fls. 9″ diam; oriental red (HCC-819), glossy throat; spr; dec. PL. 14:55. 1958.

'Charlemagne' (VM), NR; large purple red.

'Charles Penny', R; A-58. Chitt. 1933. I.—Hamb. 1892. Hb. 1:47. 1934.

'Charmaine' (Vas. 1940), R; A-59; brilliant red, creamy throat. Hb. 6:155. 1940.

'Chartreuse' (BM. 1957), R; A-575, D-5B; U-2fld; 18″ h; fls. 7½″ diam; chartreuse green, flushed cream and porcelain rose, scarlet lines. PL. 17:51. 1961.

'Chelsoni' (VE), R; A-60; **A. pardina** hybrid. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Cherokee' (W-WS. 1954), R; A-496; U-4fld; 26″ h; fls. 8″ diam; metalic red with orange cast. PL. 15:45. 1959.

'Cherry' (BM. 1955), R; A-576, D-5B; U-3fld; 24″ h; fls. 8″ diam; cherry red (HCC-722). PL. 17:51. 1961.

'Cherry Bing' (BM. 1958), R; A-577, D-5B; U-2fld; 14″ h; fls. 8″ diam; cherry red (HCC-722), tips lighter shade. PL. 17:51. 1961.

'Cherry Flip' (BM. 1958), R; A-578, D-5B; U-3fld; 15″ h; fls. 7″ diam; cherry red (HCC-722), currant red overlay. PL. 17:51. 1961.

'Cherry Liquor' (BM. 1959), R; A-635, D-5B; U-3fld; 18″ h; fls. 8″ diam; cherry red (HCC-722), lighter shade towards throat. PL. 17:52.

1961.

'Cherry Queen' (Lud.), NR; U-4fld; 30″ h; fls. 7″ diam; cherry red (HCC-722). c. Ludwig & Co. 1954.

'Cherry Red' (Lud. 1948), R; A-61; cherry red (HCC-722). Hb. 15:69. 1948.

'Chimboraso', R; A-62. Chitt. 1933. I.—Holf. 1897. Hb. 1:47. 1934.

'Chimere', R; A-63. Chitt. 1933. I.—Veit. 1895. Hb. 1:47. 1934.

'Christmas Dream' (VW. 1960), R; A-654, D5A; U-3-4fld; 22″ h; fls. 8″ diam; orange-scarlet, satin finish in throat. PL. 17:53. 1961.

'Christmas Gift' (Lud. 1959), R; A-539, D-5A; U-4fld; 23″ h; fls. 8″ diam; white with soft green throat; la.-spr. PL. 16:75. 1960.

'Christmas Joy' (W-WS), R; A-497; 24″ h; fls. 3½″ diam; red. PL. 15.45. 1959.

'Circus' (Lud. 1959), R; A-538, D-5A; U-4fld; 28″ h; fls. 9″ diam; signal red (HCC-719-719/2), white stripe and outer edge; spr. PL. 16:75. 1960.

'Clemence' (Sou.), R; A-64; **A. vittata** hybrid. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Cleopatra' (V. Hou.), R; A-65. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Cleopatra' (VM. 1953), R; A-520; 20″ h; fls. 7″ diam; pure salmon. PL. 15:46. 1959.

'Climax', R; A-66. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Clive Cookson' (Cook. 1936), R; A-67; fls. 7″ diam; vermilion, blood-red in throat; reflexed. Hb. 3:92. 1936.

'Clonia', R; A-68; white, veined red. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Clovelly', R; A-69; Chitt. 1933. I.—Holf. 1901. Hb. 1:47. 1934.

'Clown' (VW. 1958, R; A-406, D-5; U-3-4fld; 24″ h; fls. 9″ diam; white with vivid red veins. PL. 14:55. 1958.

'Colvilli' (Col.), R; A-70; **A. reticulata** x **A. reginae.** Herb. Amaryll. 1837. Hb. 1:47. 1934.

'Comte de Germiny' (Will.), R; A-71; **A. reticulata** x cl. 'Defiance'; autm. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Concerto', R; A-775, D-5A; U-4fld; 15″ h; fls. 7″ diam.; scarlet red (HCC-19); spr.; dec. I.—Goed. 1962 for Dutch grower.

'Connie Fay' (Sol. 1961), R; A-677, D-7; U-2fld; 15″ h; fls. 7½″ diam; rosy red, white in center of segs. PL. 18:42. 1962.

'Conquerant' (Sou.), R; A-72; **A. vittata** hybrid. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Coral Island' (BM. 1957), R; A-636, D-5B; U-2fld; 14″ h; fls. 7″ diam; azalea pink (HCC-619) on uranium green (63) base, rhodonite red (0022) veining, cream border. PL. 17:52. 1961.

'Corinna', R; A-73. Chitt. 1933. I.—Veit. 1893. Hb. 1:47. 1934.

'Cornut' (Ker), R; A-74, D-5; rose red. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Cornado' (Bur. 1913), R; A-75; U-3-4fld; fls. 8″ diam; scarlet with oriental crimson; e.-spr. Hb. 9:154. 1942.

'Corpus Christi' (BM. 1954), R; A-579, D-5B; U-4fld; 20″ h; fls. 7½″ diam; white, speckled scarlet and edge around all petals. PL. 17:51. 1961.

'Count Cavour' (VE.), R; A-76. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Cream Parfait' (BM. 1958), R; A-637, D-5B; U-2fld; 15″ h; fls. 8″ diam; white with jasper red markings. PL. 17:52. 1961.

'Creon', R; A-77; lower segs lilac red, upper segs veined red. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Crimson Beauty' (Lud. 1954), NR; U-3-4fld; 28″ h; fls. 8″ diam; crimson (HCC-22), tips shade darker. c. Ludwig & Co. 1954.

'Crimson Comet' (Zeiner, 1946), R; A-78, D-4A; U-4fld; fls: 6½″ diam; crimson, yellow midrib. Hb. 13:110. 1946.

'Crimson King', R; A-79; Chitt. 1933. I.—Veit. 1892. Hb. 1:47. 1934.

'Croesus' (Chandler), NR; SPN. 13. 1942.

'Croomii', R; A-80; A. elegans hybrid. Bak. Amaryll. 1888. Hb. 1:47. 1934.

'Crown Jewels' (BM), R; A-666; dark red PL. 17:52. 1961.

'Crown Prince of Germany', R; A-81. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Cupid' (Ker), R; A-82, D-5; pure white, slightly penciled red. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Cupido' (VM. 1962), NR; salmon pink. I.—Goed. 1962.

'Cupid's Rival' (Lud. 1955), NR; 28″ h; fls. 8″ diam; red, darker throat. c. Ludwig & Co. 1955.

'Currant Wine' (BM. 1960), R; A-638, D-5B; U-3fld; 18″ h; fls. 8″ diam; currant red (HCC-821). PL. 17:52. 1961.

—D—

'Dagbreek' (BM. 1956), R; A-639, D-5A; U-3-4fld; 18″ h; fls. 7½″ diam; blood red (HCC-820). PL. 17:52. 1961.

'Daintiness' (Lud. 1954), R; A-428, D-5B; U-4fld; 24″ h; fls. 8″ diam; porcelain rose (HCC-620), crimson rose towards center of segs. c. Ludwig & Co. 1954. PL. 14:55. 1958.

'Dallas Bride' (BM. 1954), R; A-640, D-5B; U-4fld; 18″ h; fls. 7½″ diam; pure white. PL. 17:52. 1961.

'Danny Kaye' (VW. 1962), R; A-733, D-5A; U-4fld; fls. 8″ diam; scarlet (HCC-19), creamy midrib deep in throat; spr. PL. 19:67. 1963.

'Daones', R; A-83. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Dark Red Bonnet' (Vas. 1940), R; A-86; fls. 7″ diam; dark red. Hb. 6.155. 1940.

'Dark Red Bonnet' (Camm.), NR. PL. 10:79. 1954.

'Daudenii' (Herb.), R; A-84; cl. 'Griffini' x **a. johnsonii.** Hb. 1:47. 1934.

'David Hollestelle' (VW. 1962), R; A-734, D-5A; U-4fld; 18″ h; fls. 8″ diam; scarlet (HCC-19); spr. PL. 19:67. 1963.

'Dawn' (Heat. 1934), R; A-87, D-5; U-3fld; fls. 10″ diam; white, pink veins lower petals; spr; dec. Hb. 1:105. 1934.

'Dawn' (BM. 1955), R; A-580, D-5B; U-3fld; 18″ h; fls. 7″ diam; creamy white, flushed empire rose. PL. 17:51. 1961.

'Dawn Rose' (BM. 1954), R; A-581, D-5B; U-2fld; 16″ h; fls. 7″ diam; porcelain rose (HCC-620) and white, scarlet stitching; spr. PL. 17:51. 1961.

'Day Dream, R; A-776, D-5A; U-4fld; 19″ h; fls. 7″ diam; dawn pink (HCC-523), lower petsegs lighter shade; spr., dec. I.—Goed. for a Dutch breeder.

'Debra Solomon' (Sol. 1961), R; A-673, D-5A; U-4fld; 16″ h; fls. 8″ diam; rose bengal (HCC-25/2-25), darker throat; spr. PL. 18:42. 1962.

'Deceit' (Zeiner, 1944), R; A-88; fls. 8″ diam; rose with white stripe, later changing to scarlet. Hb. 11:266. 1944.

'Decora' (VW. 1960), R; A-655, D-5; U-4fld; 20″ h; fls. 8″ diam; rose with carmine ribs, carmine blotch towards throat; e. spr. PL. 17:53. 1961.

'Deetta Pye' (Vas. 1940), R; A-89; fls. 8″ diam; red with stamens yellow at base. Hb. 6:155. 1940.

'Defiance' (V. Hou.), R; A-85. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'DeGraff' (Graaff, J. de), R; A-90. Hb. 1:47. 1934.

'Delilah' (Lud. 1954), R; A-429, D-5A; U-4fld; 25″ h; fls. 8″ diam; begonia pink (HCC-619), darker throat; spr; dec. c. Ludwig & Co. 1954. PL. 14.55. 1958.

'Diamond' (Lud. 1954), R; A-430, D-5A; U-4fld; 25″ h; fls. 9″ diam; geranium lake (HCC-20), glossy red throat; spr; dec. PL. 14:55. 1958.

'Diana', NR; HB. 1:63. 1934.

'Dido' (VM), NR; salmon rose.

'Digweedi' (Herb.), R; A-91; **A. reticulata** x **A. vittata.** Hb. 1:47. 1934.

'Display' (BM. 1958), R; A-582, D-5A; U-4fld; 18″ h; fls. 7″ diam;

vermilion (HCC-18), carmine flushing; spr. PL. 17:52. 1961.

'Dixie' (BM. 1958), R; A-583, D-5B; U-2fld; 18″ h; fls. 8½″ diam. scarlet (HCC-19) flushed white in center; spr. PL. 17:52. 1961.

'Doanes', R; A-92; zinnabar red with white edge. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Donald Mitchel' (Mitch. 1961), R; A-675, D-5A; U-4fld; 22″ h; fls. 9″ diam; tyrian rose (HCC-24/1), white midrib, greenish-white throat. PL. 18:42. 1962.

'Don Camilo' (Lud.), NR; scarlet.

'Don Juan' (VM), NR; brilliant red.

'Donnii' (Herb.), R; A-93. Hb. 1:47. 1934.

'Dorathy May' (Arms. 1945), R; A-95, D-5B; fls. 9″ diam; white bordered pink. Hb. 12:104. 1945.

'Doris', R; A-94. Chitt. 1933. Hb. 1:47. 1934.

'Doris Lilian' (Lud. 1950), R; A-431, D-5B; U-4fld; 26″ h; fls. 7½″ diam; carmine rose (HCC-21), tips lighter shade, glossy red throat; spr; dec. c. Ludwig & Co. 1954. PL. 14.55. 1958.

'Drakensberg' (BM. 1958), R; A-584, D-5B; U-3fld; 18″ h; fls. 9″ diam; blood red (HCC-820). PL. 17:52. 1961.

'Dresden Beauty' (Ram. 1959), R; A-544, D-4A; 22″ h; fls. 6½″ diam; white with porcelain rose (HCC-620) edging and markings; spr; dec. PL. 16:76. 1960.

'Dr. Johns' (Dug. 1958), R; A-402, D-3; 24″ h; fls. 7½″ diam; cardinal red (HCC-822); fr. PL. 14.54, 1958.

'Dr. Masters' (Will.), R; A-96, D-5; clear red; A. pardinum hybrid. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Dr. Pickard' (Pick. 1959), R; A-537, D-5A; fls. 9″ diam; dark red. PL. 16:106, f. 27. 1960.

'Duchess of Windsor' (T & H. 1938), R; A-97; pink. Hb. 5:91. 1938.

'Duke of York', R; A-103. Chitt. 1933. Hb. 1:47. 1934.

'Dulas', R; A-104; rose, deep red towards center. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Dutch Belle' (Lud. 1963), R; A-755, D-5A; U-3-4fld; 26″ h; fls. 8″ diam; rose opal (HCC-o22), darker throat; spr.

'Dutch Doll' (Lud. 1962), R; A-703, D-5A; U-4fld; 24″ h; fls. 9″ diam; picotee type, pure white with red edge; spr. PL. 19:65. 1963.

'Dutch Gold' (Lud.), NR; copper color.

'Dutch Master' (W-WS. 1962), R; A-709. D-5A; U-2fld; 22″ h; fls. 7½″ diam; rose bengal (HCC-25) on white base, white edge on segs; spr. PL. 19:65. 1963.

—E—

'Early Queen' (Lud.), NR.

'Early White' (Lud. 1948), R; A-105. U-4-5fld; 22″ h; fls. 7½″ diam; pure white. Hb. 15:69. 1948.

'Eastern Glory' (BM. 1954), R; A-585, D-5B; U-3fld; 18″ h; fls. 7″ diam; mandarin red (HCC-17), oxblood red flush towards center spr. PL. 17:52. 1961.

'Eclatante' (Ker), R; A-106, D-5; red with purple sheen. Hb. 1:47. 1934.

'Eclipse', R; A-107; white, veined red border. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Edelweiss' (Hay. 1936), R; A-108, D-5; fls. 7″ diam; pure white. Hb. 3:92. 1936.

'Edith' (Hay. 1935), R; A-109. Hb. 2:92. 1935.

'Edith M. Wynne' (Veit.), R; A-110; **A. reticulata striatifolia x A. Leopoldii;** autm. Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Edlena' (McCann), NR; D-7; pink and white, segs keeled white. Traub, Amaryll. 90. 1958.

'Edward Hall' (Heat. 1935), NR; white with light red markings. Hb. 2:56. 1935.

'Eglamor' (Veit.), R; A-111, D-5; Nehr. Amaryll. 1909. Hb. 1:47. 1934.

'Eldorado', R; A-112. Chitt. 1933. I.—Veit. 1893. Hb. 1:47. 1934.

'Eleanor Roosevelt' (Dom. 1934), NR. Hb. 2:92. 1935.

'Elizabeth' (Camm.), NR; Traub, Amaryll. 61. 1958.

'Elizabeth Traub' (Henry, 1951), NR; D-8; U-2fld; 7″ h; carmine (HCC-21/1); **A. belladonna var. haywardii x A. espiritensis;** win; ev. PL. 7:117-118 f. 22. 1951.

'Ella Maie Stevens' (T & H, 1937), R; A-113, D-5B; U-4-6fld; 24″ h; fls. 8″ diam; white base, veined red, white midrib. Hb. 4:143. 1937.

'Elvira Aramayo' (W-WS. 1962), R; A-684, D-5A; U-4fld; 20″ h; fls. 7″ diam; carmine (HCC-21), magenta rose overlay. PL. 19:65. 1963.

'Emma Piper' (T & H, 1937), R; A-114, D-5B; U-5fld; 25″ h; fls. 8″ diam; upper three segs banded white and veined rose, lower setsegs and lower, petseg, white. Hb. 4:143. 1937.

'Empress of India' (Graaff, S. 1860), R; A-115; U-4-6fld; **A. psittacina** x cl. 'Graveana'. Hb. 1:48. 1934.

'Enchantress' (Veit.), R; A-116; rose red, striped carmine; fr. Nehr. Amaryll. 1909. Hb. 1:48. 1934.

'Eola' (Heat. 1934), R; A-117; white with light red markings. Hb. 2:56, 90. 1935.

'E. P. Hall' (Heat. 1934), R; A-118. Hb. 2:90. 1935.

'Ernestine' (Hay. 1937), R; A-119, D-5B; fls. 9″ diam; lavender rose red with white keel. Hb. 4:115, PL. 58. 1937.

'Ernest Pye' (Vas. 1940), R; A-120; fls. 8″ diam; red, suffused with white towards center. Hb. 6:155. 1940.

'Ernst Ludwig' (Lud.), NR; dark red.

'Eros', R; A-121. Chitt. 1933. I.—Veit. 1896. Hb. 1:48. 1934.

'Esther' (Pfis.), R; A-122; cl. 'Dr. Masters' x **A. pardina.** Hb. 1:48. 1934.

'Eternal Youth' (Terry, 1961), R; A-676, D-5A; U-4fld; 20″ h; fls. 8″ diam; upper segs delft rose (HCC-20/1), petseg to half of tip, white; spr; cl. 'Pink Favorite' x cl. 'Ludwig Dazzler'. PL. 18:42. 1962.

'Ethel Duckworth' (Hay. 1937), R; A-123, D-5B; fls. 8″ diam; velvet red, darker in throat, seg tips lighter shade. Hb. 4:142. pla. 59:116. 1937.

'Etiole' (Sou.), R; A-124; A vittatum hybrid; yellowish white, red stripes. Nehr. Amaryll. 1909. Hb. 1:48. 1934.

'Etna' (BM. 1959), R; A-586, D-5A; U-3fld; 22″ h; fls. 7½″ diam; dutch vermilion (HCC-717). PL. 17:52. 1961.

'Etta McNeel' (T & H, 1938), R; A-125; pink. Hb. 5:91. 1938.

'Eubank's White' (Eub. 1961), R; A-668, D-5A; U-4fld; 20″ h; fls. 8½″ diam; white, light chartreuse green in throat. PL. 18:42. 1962.

'Eurasian', R; A-126. Chitt. 1933. I.—Veit. 1913. Hb. 1:48. 1934.

'Evalena' (Arms. 1949), R; A-127, D-5A; fls. 9½″ diam; velvety red, white throat; fr. PL. 5:88. 1949.

'evansiae' (Traub & Nelson), species; three color forms—pastel pink, chartreuse, and very light yellowish; from Bolivia. Baileya 4:85-88, f. 30-31. 1956. PL. 14:29, f. 4:29. 1958. (see 'Senorita').

'Excellent', R; A-128. Chitt. 1933. I.—Veit. 1893. Hb. 1:48. 1934.

'Exhibition' (Zeiner), NR; scarlet, with white stripe. Hb. 11:256. 1944.

'Extase' (W-WS. 1962), R; A-710, D-5A; U-3fld; 36″ h; fls. 9″ diam; cardinal red (HCC-822), darker throat, bearded, ruffled edges; spr. PL. 19:66. 1963.

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'Fabiola' (VM. 1953), R; A-521. D-4; 24″ h; fls. 8″ diam; bright red. PL. 15:46. 1959.

'Fair Lady', R; A-129. Chitt. 1933. I.—Veit. 1903. Hb. 1:48. 1934.

'Fair Lady', R; A-777, D-5A; U-3fld; 18″ h; fls. 8″-9″ diam; pinpoints of vermilion (HCC-18/1) appears as solid color, blood red and light white lines; spr., dec. I.—Goed. 1962 for a Dutch breeder.

'Faith' (Heat. 1934), R; A-130; U-3fld; fls. 7½" diam; bright red, veined darker red, red keel; ev. Hb. 1:105. 1934.

'Faith' (Park. 1955), NR; U-2fld; fls. 8" diam; white, red border; reflexed; spr. PL. 11:62. 1955.

'Fan Tan' (Har. 1959), R; A-549, D-5A; 22" h; fls. 8" diam; signal red (HCC-719), white stripes forming a star, greenish throat, white border; spr; fr. PL. 16:75. 1960.

'Fantasy' (Lud. 1948), R; A-131; rose, lighter throat, margins on segs. Hb. 15:69. 1948.

'Fantasy' (Lud. 1950), R; A-432, D-5A; U-4fld; 25" h; fls. 7½" diam; delft rose (HCC-o20), light rose stripe on each seg, apple green throat with faint red ring deep in throat. c. Ludwig & Co. 1954. PL. 14:55. 1958.

'Fashion' (Laine, 1963), R; A-747, D-5A; U-3-4fld; 18" fls. 7" diam; scarlet red (HCC-19).

'Faust' (VM. 1949), R; A-522, D-4; 32" h; fls. 8" diam; dutch vermilion (HCC-717). PL. 15:46. 1959.

'Favorite' (Veit.), R; A-132; **A. reticulata X A. leopoldii;** autm. Hb. 1:48. 1934.

'Feline Repose' (BM. 1956), R; A587, D-5B; U-3fld; 18" h; fls. 7" diam; geranium lake (HCC-20), fused with white. PL. 17:52. 1961.

'Fidelity' (Lud. 1950), NR; U-3-4fld; 24" h; fls. 7½" diam; spinel pink (HCC-o625-o625/1). PL. 7:73. 1951.

'Fiedelio' (VE), R; A-133. Nehr. Amaryll. 1909. Hb. 1:48. 1934.

'Field Marshall', R; A-134. Chitt. 1933. I.—Holf. 1906. Hb. 1:48. 1934.

'Finette' (Ker), R; A-135, D-5; white, few red stripes. Nehr. Amaryll. 1909; Hb. 1:48. 1934.

'Fire' (T & H, 1938), R; A-136; red. Hb. 5:91. 1938.

'Fire Bird', R; A-678, D-5A; U-4fld; fls. 9" diam; orange red, darker throat, back of segs white, spotted red. I.—Goed. 1961. PL. 18:43. 1962.

'Firebrand', R; A-137. Chitt. 1933. I.—Paul, 1892. Hb. 1:48. 1934.

'First Century' (BM. 1962), NR; white, scarlet flushing.

'Fire Dance' (Lud. 1958), R; A-465, D-5A; U-4fld; 24" h; fls. 10" diam; dutch vermilion (HCC-717), violet red throat; spr; dec. PL. 15:43. 1959.

'Fire Fly' (Lud. 1958), R; A-469, D-8; U-4-6fld; 16" h; fls. 4" diam; capsicum red (HCC-715), darker throat; spr; dec. PL. 15:43. 1959.

'Fire King' (Lud.), NR; U-4fld; 18" h; fls. 6" diam; scarlet, deepening to medium red in throat. PL. 7:72. 1951.

'Fire King' (Camm.), NR; PL. 10:79. 1954.

'Five Star General' (Lud. 1955), R; A-434, D-5A; U-4fld; 30" h; fls. 10" diam; signal red (HCC-719), white star in center, dark red ring in throat; spr; dec. c. Ludwig & Co. 1955. PL. 14:55. 1958.

'Flamboyant' (W-C. 1962), R; A-726, D-5A; U-3-4fld; 16" fls. 7" diam; orient red (HCC-819); spr. I.—Goed. 1962. PL. 19:67. 1963.

'Flame' (Hay. 1935), NR; Hb. 2:92. 1935.

'Flame' (Schm. 1962), R; A-693, D-7; U-4fld; 20" h; fls. 6" diam; vermilion red (HCC-18); spr. PL. 19:66. 1963.

'Flamingo' (Whe. 1941), R; A-138, D-5A; fls. 8" diam; rose pink, shading to shell pink. Hb. 8:92. 1941.

'Flora' (Ker), R; A-139, D-5; white, pale red border and veins. Nehr. Amaryll. 1909. Hb. 1:48. 1934.

'Floralien' (W-WS. 1962), R; A-711, D-5A; U-4fld; 24" h; fls. 8" diam; blend of white and rose madder (HCC-23), veined rose red and white stripe on edge of segs. PL. 19:66. 1963.

'Floral Queen' (Lud. 1960), R; A-556, D-5A; U-4fld; 26" h; fls. 8" diam; spinel red (HCC-o625), dark veins deep in throat; spr. PL. 17:53. 1961.

'Florence Raasch' (Raa. 1960), R; A-554, D-4A; U-4fld; 26" h; fls. 6½" diam; rose red (HCC-724), darker in throat; spr. PL. 17:51. 1961.

'Florence Springer' (Spring. 1937), R; A-140; U-4-5fld; 24″ h; fls. 7″ diam; medium red (M & P, 2-L-8), white penciling in throat and center of segs; ev. Hb. 4:142. 1937.

'Floriade' (W-WS. 1962), R; A-712, D-5A; U-4fld; 24″ h; fls. 9″ diam; blend of white and rose pink (HCC-427), tyrian rose (727) stripes each side midrib on upper three segs. PL. 19:66. 1963.

'Florida' (Tilg. 1934), NR. Hb. 2:90. 1935.

'Florida' (BM. 1957), R; A-588, D-5B; U-2fld; 16″ h; fls. 7½″ diam; azalea pink (HCC-618), flushed white. PL. 17:52. 1961.

'Florida Beauty' (Camm.), NR. PL. 10:79. 1954.

'Florida Maid' (Hay. 1938), R; A-141, D-5; U-4fld; fls. 8″ diam; rose pink, flushed and veined on white. Hb. 5:146. 1938.

'Flower Record' (W-WS. 1959), R; A-516; 23″ h; fls. 3″ diam; deep scarlet (HCC-19). PL. 15:45. 1959.

'Flying Cloud', R; A-679, D-5A; U-4fld; fls. 8″ diam; white with green throat. I.—Goed. 1961. PL. 18:43. 1962.

'Formosa', R; A-142; **A. reticulata** hybrid. Bak. Amaryll. 1888. Hb. 1:48. 1934.

'Foster Dulles' (VW. 1960), R; A-656; U-4fld; 24″ h; fls. 8″ diam; scarlet (HCC-19). PL. 17:53. 1961.

'Francisca', R; Nehr. Amaryll. 1909. Hb. 1:48. 1934.

'Francis Drake' (BM. 1954), R; A-589, D-5B; U-3fld 18″ h; fls. 7″ diam; geranium lake (HCC-20), scarlet and signal red fused with white. PL. 17:52. 1961.

'Franklin Roosevelt' (Lud. 1954), R; A-433, D-5B; U-4fld; 25″ h; fls. 7½″ diam; currant red (HCC-821), upper segs darker, dark red throat; spr; dec. c. Ludwig & Co. 1954. PL. 14:55. 1958.

'Frank Wootten' (Traub, 1934), NR. Hb. 2:92. 1935.

'Freckles' (Zeiner, 1947), R; A-145, D-5B; white with pink spots and stripes. Hb. 14:128. 1947.

Friendship' (VM. 1956), R; A-523, D-4; 28″ h; fls. 7″ diam; salmon with a white glow. PL. 15.46. 1959.

'Frilled Queen' (Chandler), NR. SPN. 13. 1942.

'Fritz Kreisler', R; A-778, D-5A; U-4-5fld; 22″ h; fls. 6″-7″ diam; camelia rose (HCC-622-622/1); spr., dec. I.—Goed. 1962 for a Dutch breeder.

'Fuchsia Rose' (Ram. 1959), R; A-545, D-5A; 22″ h; fls. 6½″ diam; fuchsia rose; spr; dec. PL. 16:76. 1960.

'Fucinus', R; A-146; cream yellow, dotted red. Nehr. Amaryll. 1909. Hb. 1:48. 1934.

'Fulda' (VW. 1958), R; A-407; U-3-4fld; 28″ h; fls. 10″ diam; orange red (HCC-19). PL. 14:55. 1958.

'Fulgens', R; A-147. Chitt. 1933. I.—Back. 1865. Hb. 1:48. 1934.

'Full Moon' (Hay. 1935), NR. Hb. 2:92. 1935.

—G—

'Garfieldii' (GPC. 1937), R; A-148; U-4fld; orange red with star. syn: "Hippecoris Garfieldii no. 30". I.—AAS. 1937. Hb. 4:142. 1937.

'Garfield Triumph' (GPC), NR; D-3.

'Garibaldi' (VM), NR; orange red.

'Garnet King' (Zeiner), NR; solid red. Hb. 11:256. 1944.

'Gem', R; A-149. Chitt. 1933. I.—Veit. 1894. Hb. 1:48. 1938.

'Gemato' (Mull. 1962), R; A-701, D-5B; U-4fld; 15″ h; fls. 5½″ diam; blood red (HCC-820), white band around all petals; spr; fr. PL. 19:67. 1963.

'General Buller', R; A-150. Chitt. 1933. I.—Veit. 1902. Hb. 1:48. 1934.

'General Eisenhower' (VW. 1960), R; A-657, D-5A; U-3-4fld; 21″ h; fls. 7″ diam; salmon (HCC-412), darker throat. PL. 17:53. 1961.

'Gerald Ash' (BM. 1958), R; A-590, D-5B; U-3fld; 18″ h; fls. 8″ diam; geranium lake (HCC-20), flushed carmine rose and white. PL. 17:52. 1961.

'Geranium Lake' (BM. 1955), R; A-641, D-5B; U-4-5fld; 24″ h; fls. 7½″ diam; geranium lake (HCC-20), slight white flush. PL. 17:52. 1961.

'Gereant', R; A-151. Chitt. 1933. I.—Holf. 1910. Hb. 1:48. 1934.

'Gertrude' (BM. 1962), NR; creamy white, brushed in scarlet, white border.

'G. Firth' (Will.), R; A-152; 'Defiance' x **A. reticulata;** autm. Hb. 1:48. 1934.

'Ghent' (BM. 1958), R; A-591, D-5B; U-3-4fld; 18″ h; fls. 9″ diam; azalea pink (HCC-618), white star, poppy red overlay. PL. 17:52. 1961.

'Giant Goliath' (VM. 1953), R; A-524; 28″ h; fls. 9″ diam; vermilion (HCC-18). PL. 15:46. 1959.

'Giant Near White' (Camm.), NR. PL. 10:79. 1954.

'Giant Orange' (Zeiner, 1944), R; A-153; orange with white stripe. Hb. 11:266. 1944.

'Gilroy' (Brn. 1943), R; A-154; U-3fld; fls. 8″ diam; red. Hb. 10:94. 1943.

'Girl Guide' (BM. 1962), NR; vermilion, white star.

'x gladwynensis' (Henry, 1950), hybrid; U-2fld; carmine in type; **A. belladonna** var. **haywardii** x **A. johnsonii.** PL. 7:118-121, pla. 18. 1951. cl. 'Mary Davis'. PL. 8:86. 1952.

'Glamour' (Whe. 1941), R; A-155, D-4B; fls. 8″ diam; white, wine red splotches upper three segs and upper half of lower setsegs. Hb. 8:92. 1941.

'Gloria' (Heat. 1938), R; A-156, D-4; light violet with darker veining shaded to light pink at tips. Hb. 5:146. 1938.

'Gloriosa', R; A-157; **A. reticulata** hybrid. Bak. Amaryll. 1888. Hb. 1:48. 1934.

'Glorious' (Heat. 1935), NR. SPN. 13. 1942.

'Gold Dust' (Zeiner, 1947), R; A-158, D-5A; fls. 8½″ diam; orange red. Hb. 14:128. 1947.

'Golden Triumphator' (W-WS. 1962), R; A-696, D-5A; U-3fld; 21″ h; fls. 9″ diam; mars orange (HCC-o13), orange and brick red blend to throat in upper 3 segs, lower segs lighter shade. PL. 19:65. 1963.

'Goliath' (Hay. 1935), NR. Hb. 2:92. 1935.

'Gondibar' (VM), NR; red.

'Gorgeous', R; A-159; carmine red. Nehr. Amaryll. 1909. I.—Veit. 1895. Hb. 1:48. 1934.

'Gowenii' (Herb.), R; A-160; **A. reticulata** x **A. elegans.** Hb. 1:48. 1934.

'Gracchus', R; A-161. Chitt. 1933. I.—Veit. 1909. Hb. 1:48. 1934.

'Grace' (Schm. 1962), R; A-696, D-5A; U-3fld; 18″ h; fls. 6″ diam; white, orient red stripes and edging on 2 upper petsegs, greenish throat. PL. 19:66. 1963.

'Gracilis Boegschoten' (VM. 1946), R; A-536, D-8; U-2fld; 18″ h; fls. 3″ diam; red. PL. 15:47. 1959.

'Grahamii' (Herb.), R; A-162; **A. johnsonii** x **A. vittata.** Hb. 1:48. 1934.

'Grand Bay' (Perr. 1962), R; A-698, D-5A; U-4fld; 18″ h; fls. 6″ diam; geranium lake (HCC-20/1), white midribs, segs dotted with reddish spots. PL. 19:66. 1963.

'Grand Mist' (Perr. 1961), R; A-674, D-4A; U-4fld; 20″ h; fls. 7″ diam; white, green throat, red markings deep in throat. PL. 18:43. 1962.

'Grand Monarch', R; A-163. Chitt. 1933. I.—Veit. 1890. Hb. 1:48. 1934.

'Graveana' (Graaff, J. de), NR;. x **A. vittata** and **A. striata** vars. **fulgida** and **crocata.** Hb. 1:48. 1934. Traub, Amaryll.:46. 1958.

'Gravinae' (Mel.), R; A-164, D-4; glowing red, banded white. Bak. Amaryll. 1888. Hb. 1:48. 1934.

'Greta Garbo' (Traub, 1934), NR. Hb. 2:92. 1935.

'Griffinii' (Grif.), R; A-165; **A. psittacina** x **A. johnsonii.** Herb, Amaryll. 1837. Hb. 1:48. 1934.

'Guardsman' (Chandler), NR; SPN. 13. 1942.

—H—

'Haarlem' (BM. 1957), R; A-592, D-5B; U-4fld; 24″ h; fls. 7½″ diam;

vermilion (HCC-18), white on midribs. PL. 17:52. 1961.

'Haarlem' (VW. 1960), R; A-658, D-5; U-3-4fld; 21″ h; fls. 7″ diam; bishop's red, with satin red throat. PL. 17:53. 1961.

'Hades' (VM. 1962), NR; dark red. I.—Goed. 1962.

'Halley' (Lud. 1950), R; A-435, D-5B; U-4fld; 25″ h; fls. 8½″ diam; poppy red (HCC-16), dark throat and veins. PL. 7:72. 1951.

'Hannibal' (VM), NR; scarlet.

'Happy Memory' (Lud. 1963), R; A-757, D-5A; U-4fld; 32″ h; fls. 10″ diam; capsicum red (HCC-715) and white combination.

'Harlequin' (Chandler), NR. SPN. 13. 1942.

'Harrisonii' (Harr., R.), R; A-166; **A. reticulata** x **A. stylosa.** Herb. Amaryll. 1837. Hb. 1:48. 1934.

'Harry Searles' (Searles, 1934), NR; Hb. 2:92. 1935.

'Harry St. John' (St. J. 1956), R; A-391, D-5B; 20″ h; fls. 7″ diam; dark red, darker throat; spr; ev. PL. 14:54. 1958.

'Harvest Moon' (Camm.), NR; PL. 10:79. 1954.

'Haylockii' (Sweet), R; A-167; **A. elegans** x **A. striata,** Herb. Amaryll. 1837. Hb. 1:48. 1934.

'Heaven Sent' (Lud. 1963), R; A-758, D-5A; U-3fld; 22″ h; fls. 9″ diam; camelia rose (HCC-622-622/2).

'Helen' (Heat. 1934), NR. Hb. 2:90. 1935.

'Helen' (Lud. 1954), R; A-436, D-5B; U-4-5fld; 28″ h; fls. 8″ diam. begonia pink (HCC-619-619/1), white ring in throat; spr; dec. v. Ludwig & Co. 1954. PL. 14:55. 1958.

'Helen Hull' (McCann), NR; D-7. PL. 10:28, f. 2. 1954.

'Helen Jane' (Tilg. 1934), NR; light red. Hb. 2:58. 1935.

'Helen L. Heaton' (Heat. 1938), R; A-168, D-5; pure white, violet feathering on upper segs. Hb. 5:146. 1938.

'Helen Tilghman' (Tilg. 1934), NR; fls. 8″ diam; red, white star. Hb. 2:58, 90. 1935.

'Hellas' (VM. 1962), NR; stone red, white center. I. Goed. 1962.

'Hendersonii', R; A-169, D-5; Nehr. Amaryll. 1909. Hb. 1:48. 1934.

'Hendersonii Coccinea', R; A-170; **A. leopoldii** hybrid. Nehr. Amaryll. 1909. Hb. 1:48. 1934.

x **henryae** Traub, PL. 7:117-118, f. 22. 1951; Amaryll. Man. fc. (frontispiece). 1958; fls. light pink; **A. belladonna** var. **haywardii** x **A. espiritensis.**

'Henry Nehrling' (Heat. 1934), NR. Hb. 2:90. 1935.

'Henslowii' (Herb.), R; A-171; **A. reginae** x **A. striata.** Hb. 1:48. 1934.

'Heracles' (Lud.), NR; U-4fld; 28″ h; fls. 9″ diam; oxblood red (HCC-820). c. Ludwig & Co. 1954.

'Herbertii' (Sweet), NR; pale orange. Herb. Amaryll. 1909. Hb. 1:48. 1934.

'Her Majesty' (Will.), R; A-172; cl. 'Defiance' x **A. reticulata;** autm. Nehr. Amaryll. 1909. Hb. 1:48. 1934.

'Hermita' (Veit.), R; A-173, D-5; lilac red with green throat. Nehr. Amaryll. 1909. Hb. 1:48. 1934.

'Hex River' (BM. 1958), R; A-593, D-5B; U-3fld; 18″ h; fls. 7″ diam; mandarin red (HCC-17). PL. 17:52. 1961.

'Hidalgo', R; A-174; orange red, shaded carmine. Nehr. Amaryll. 1909. Hb. 1:48. 1934.

'Hidenley' (Str.), R; A-175; "Acramanii Pulcherrinum" x **A. reticulata;** autm. Nehr. Amaryll. 1909. Hb. 1:48. 1934.

"Hippecoris Garfieldii", NR. (see 'August Koch').

'Holloway Belle' (Will.), R; A-176, D-5; Nehr. Amaryll. 1909. Hb. 1:48. 1934.

'Home Decorator' (Lud. 1962), R; A-702, D-5A; U-4fld; 28″ h; fls. 9″ diam; poppy red (HCC-16/1), darker throat, suffused with salmon. PL. 19:64. 1963.

'Hong Kong' (VM. 1962), R; A-720, D-5A; U-4fld; 22″ h; fls. 8″ diam; blood red (HCC-820), currant red throat, slightly bearded. PL. 19:67. 1963.

'Hon. Maurice Gifford', R; A-177. Chitt. 1933. Hb. 1:48. 1934.

'Hoodii' (Sweet), NR; **A. belladonna x A. reginae.** Herb. Amaryll. 1837. Hb. 1:48. 1934.

'Hookeri' (Herb.), NR; 'Gowenii' x **A. vittata.** Hb. 1:48. 1934.

'House of Orange' (VW. 1958), R; A-408; U-3-5fld; 28" h; fls. 2" diam; flaming orange. PL. 14:55. 1958.

—I—

'Iceberg', R; A-178. Chitt. 1933. I.—Holf. 1925. Hb. 1:48. 1934.

'Ideala' (Veit. 1897), R; A-179; creamy white with orange-scarlet dots. Nehr. Amaryll. 1909. Hb. 1:48. 1934.

'Ignacite', R; A-180; white, light green in throat, feathered red. Nehr. Amaryll. 1909. I.—Veit. 1897. Hb. 1:48. 1934.

'Ignescens', R; A-181. I.—Veit. 1865. Hb. 1:49. 1934.

'Imperator' (VM). NR; orange red.

'Imperatrice du Bresit', R; A-182. Chitt. 1933. I.—Law. 1902. Hb. 1:49. 1934.

'Impertinence' (BM. 1954), R; A-594, D-5B; U-4fld; 16" h; fls. 7½" diam; white, veined turkey red and blood red. PL. 17:52. 1961.

'Independence' (VW. 1962), R; A-735, D-5A; U-4fld; 26" h; fls. 8" diam; vermilion red (HCC-18), currant red deep in throat. PL. 19:67. 1963.

'Invincible' (Lud. 1950), R; A-437, D-5A; U-4fld; 28" h; fls. 9" diam; capsicum red (HCC-715), dark red throat; spr. PL. 7:72. 1951.

'Invitation' (BM. 1954), R; A-595, D-5B; U-3fld; 14" h; fls. 7" diam. creamy white, speckled camelia rose. PL. 17:52. 1961.

'Irene' (W-WZ. 1962), R; A-713, D-5A; U-4fld; 18" h; fls. 8" diam; salmon pink (HCC-619), lighter seg margins. I.—Goed. 1962. PL. 19:66. 1963.

'Iris' (Ker), R; A-183, D-5; white, pale red veins. Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Istanbul' (BM. 1958), R; A-596, D5-B; U-3fld; 14" h; fls. 7" diam; turkey red (HCC-721), central white star. PL. 17:52. 1961.

—J—

'Jack Frost' (Zeiner, 1947), R; A-184, D-4B; white with pink stripes. Hb. 14:128. 1947.

'Jasper', R; A-186. Chitt. 1933. I.—Ker. 1906. Hb. 1:49. 1934.

'Jasper' (BM. 1954), R; A-597, D-5B; U-3fld; 20" h; fls. 7½" diam; shades of jasper red (HCC-o18), capsicum red flushing. PL. 17:52. 1961.

'Java' (Rice), NR; purple or magenta with pure white throat. PL. 11:84. 1955.

'Jaygee' (Arms. 1949), R; A-185, D-5B; fls. 7" diam; light red, dark markings in throat. PL. 5:88. 1949.

'Jean Swope' (Vas. 1940), R; A-187; fls. 7"-8" diam.; cerise red, yellowish in center. Hb. 6:155. 1940.

'Jean Van Doesburg' (BM. 1958), R; A-598, D-5B; U-3fld; 18" h; fls. 9½" diam; begonia (HCC-619), flushed white towards center. PL. 17:52. 1961.

'Jefferson' (Whe. 1941), R; A-188, D-4A; fls. 9" diam; medium dark red. Hb. 8:91-92. 1941.

'Jewel Box' (BM. 1958), R; A-599; shades of salmon, brick red, scarlet, and jasper red. PL. 17:52. 1961.

'Joan of Arc' (W-WS), R; A-498; U-4-6fld; 24" h; fls. 7½" diam; pure glistening white with green in throat. PL. 15:45. 1959.

'John Heal' (Veit.), R; A-189. **A. leopoldii** hybrid. Hb. 1:49. 1934.

'John Ruskin', R; A-190; orange scarlet, white bands. Hb. 1:49. 1934.

x **johnsonii** (John. 1800), NR; syn: **Amaryllis braziliensis; H. vittatua x A. reginae.** Hb. 1:49. 1934. Nehr. Amaryll. 1909.

'John Vasku' (Vas. 1940), R; A-191; fls. 8" diam; red, white throat and keels. Hb. 6:155. 1940.

'Joy' (VM. 1963), R.; A-770; salmon with white stripe.

'J. R. Pitcher', R; A-192. Chitt. 1933. I.—Will. 1891. Hb. 1:49. 1934.

'Julia' (VM. 1950), R; A-525, D-4; 24″ h; fls. 7½″ diam; orange red. PL. 15:46. 1959.

'Juliana' (BM. 1954), R; A-600, D-5B; U-3fld; 18″ h; fls. 8½″ diam; dutch vermilion (HCC-717), rose and flushed white. PL. 17:52. 1961.

'Julius', R; A-193. Chitt. 1933. I.—Veit. 1903. Hb. 1:49. 1934.

'Juno' (VM), NR; scarlet.

—K—

'Kansas' (Brn. 1943), R; A-194; U-3fld; fls. 8″ diam; dark red, darker red throat. Hb. 10:94. 1943.

'Karen Marlys' (Arms. 1945), R; A-195, D-5A; fls. 9″ diam; white, red pencilings in throat. Hb. 12:104. 1945.

'Katberg' (BM. 1962), NR; blood red, glossy throat.

'Katherine Auchter' (T&H, 1938), R; A-197; pink. Hb. 5:91. 1938.

'Kathleen Dobson' (BM. 1955), R; A-601, D-5B; U-3fld; 16″ h; fls. 7½″ diam; creamish white, light currant red pencil lines. PL. 17:52. 1961.

'Kathleen Ferrier' (VW. 1956), R; A-393; 28″ h; fls. 10″ diam; pure white with creamy throat. PL. 14:54. 1958.

'Kaye' (Schm. 1962), R; A-695, D-5A; U-3fld; 22″ h; fls. 6½″ diam; jasper red (HCC-o18), faint white streak center of segs; spr. PL. 19:66. 1963.

'Kay Harding' (T&H, 1938), R; A-198; pink. Hb. 5:91. 1938.

'Killarney' (Whe. 1940), R; A-199, D-5A; very dark red, darker satiny throat. Hb. 7:130. 1940.

'Kineton', R; A-200; light red with white star. Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'King Gustav V1 Adolph' (VM. 1956), R; A-526, D-4; 32″ h; fls. 8″ diam; bright red. PL. 15:46. 1959.

'King of Stripes' (W-WS), R; A-499; U-3-4fld; 24″ h; fls. 5″ diam; pale pink to white, two carmine lines on each seg. PL. 15:45. 1959.

'Kirby Pink' (Hay. 1935), NR; Hb. 2:92. 1935.

'Kismet' (BM. 1955), R; A-602, D-5B; U-3fld; 22″ fld; fls. 8″ diam; white with carmine flushing and veining. PL. 17:52. 1961.

'Klein Pink' (Kl. 1956), R; A-392, D-5A; 26″ h; fls. 8″ diam; pink to tip of segs, light green throat. PL. 14:54. 1958.

'Kohinoor' (Gron.), R; A-201, D-5; lilac red ground, tips of segs and center yellowish white. cl. 'Brilliant' x **A. psittacina.** Nehr. Amaryll. 1909. Hb. 1:49; 1934.

'Kranskop' (BM. 1962), NR; currant red.

—L—

'Lady Ardilaun' (Will.), R; A-202, D-5; Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Lady Helen' (Rice, 1943), R; A-203; deep blood red. Hb. 10:149. 1943.

'Lady Howick', R; A-204. Chitt. 1933. I.—Holf. 1907. Hb. 1:49. 1934.

'Lady in Red' (Whe. 1941), R; A-205, D-5A; fls. 7½″ diam; brilliant scarlet, orange tones only in lighter parts. Hb. 8:92. 1941.

'Lady Juliet Duff', R; A-206. Chitt. 1933. I.—Lady Duff, 1929. Hb. 1:49. 1934.

'Lady Margaret' (Veit.), R; A-207. **A. reticulata** x **A. leopoldii;** autm. Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Lady Winifred Gore', R; A-208. Chitt. 1933. I.—Smith, 1896. Hb. 1:49. 1934.

'Lafayette' (BM. 1954), R; A-603, D-5B; U-4fld; 16″ h; fls. 8″ diam; dutch vermilion (HCC-717), white central star. PL. 17:52. 1961.

'La Forest Morton' (Lud. 1956), R; A-390, D-5B; U-4fld; 26″ h; fls. 8″-9″ diam; china rose (HCC-o24/1) to lilac purple (o31/1) to pansy violet (o33), almost black at bottom of throat; spr. PL. 14:54, f. 8:53. 1958.

'Lakemont' (Whe. 1940), R; A-209, D-5A; solid red, darker throat, velvety texture. Hb. 7:130. 1940.

'Lamberti' (Herb.), NR; cl. 'Cartoni' x cl. 'Grahami'. Hb. 1:49. 1934.

'Laura' (Chandler), NR. SPN. 13. 1942.

'Lavaliere' (HDL. 1963), R; A-765. I.—Goed. 1964.

'Lawrence' (Brn. 1943), R; A-210; U-3fld; fls. 9″ diam; striped and spotted on white ground. Hb. 10:94. 1943.

'Leading Lady' (W-WS), R; A-500; U-3-4fld; 20″ h; fls. 7″ diam; pure white with greenish throat. PL. 15:45. 1959.

'Leah Williams' (BM. 1962), NR; soft cream, brick red.

'Lena B. Hughes' (T & H, 1937), R; A-211, D-5B; U-3fld; 28″ h; fls. 8″ diam; salmon-rose, white band in center of all segs. Hb. 4:143. 1937.

'Leo Gestel' (VM. 1963), R; A-771; salmon pink.

'Leone Schweizer' (BM.), R; A-642; pure white, carmine rose and claret rose margins. PL. 17:52. 1961.

'Leoni', R; A-212; pure white, seg tips orange red. Nehr. Amaryll. 1909. Hb. 1: 49. 1934.

'Liberator' (Lud. 1948), R; A-213; U-3-4fld; 26″ h; fls. 7″ diam; salmon-rose, rose-red throat, white mid-stripe lower petals. PL. 7:73. 1951.

'Liberty Hyde Bailey' (Lud. 1958), R; A-466, D-5A; U-4fld; 26″ h; fls. 8″-9″ diam; oriental red (HCC-819). PL. 15:43. 1959.

'Lightning' (Zeiner, 1947), R; A-214, D-4B; white, pink stripes. Hb. 14:128. 1947.

'Lightning' R; A-215. Chitt. 1933. I.—Paul, 1893. Hb. 1:49. 1934.

'Lillian' (Arms. 1949), R; A-216, D-5B; fls. 8″ diam; pink. PL. 5:88. 1949.

'Lillian Yost' (Whe. 1940), R; A-217, D-5A; fls. 8″-9″ diam; shell pink, darker rose pink feathering. Hb. 7:130. 1940.

'Lindleyi' (Herb.), NR; cl. 'Griffini x 'Carnarvoni'. Hb. 1:49. 1934.

'Lindseyi' (Hebr.), NR; **A. aulica x A. reticulata.** Hb. 1:49. 1934.

'Lion's Head' (BM. 1958), R; A-604, D-5B; U-2fld; 16″ h; fls. 9″ diam; currant red (HCC-821). PL. 17:52. 1961.

'Little Diamond' (W-WS, 1962), R; A-714, D-5A; U-4fld; 18″ h; fls. 8″ diam; dawn pink (HCC-523), white midrib in all segs; spr. PL. 19:66. 1963.

'Little Sweetheart' (Lud. 1958), R; A-470, D.8; U-4-5fld; fls. 4″ diam; salmon-red, soft greenish-white star-like throat, darker red streaks, spr. PL. 15:43. 1959.

'Lois', R; A-218. Chitt. 1933. I.—Holf. 1901. Hb. 1:49. 1934.

'Lord Amherst' (Whe. 1941), R; A-219, D-5A; fls. 9″ diam; dark crimson with violet tones. Hb. 8:91. 1941.

'Lord Bovington', R; A-220. Chitt. 1933. I.—Holf. 1901. Hb. 1:49. 1934.

'Lord Brassey' (Will.), R; A-221, D-5A;. Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Lord Roberts', R; A-222. Chitt. 1933 I.—Will. 1895. Hb. 1:49. 1934.

'Louise Hayward' (Hay. 1940), R; A-223; snowy white, apple green shading in throat. Hb. 7:131, Plate 180:129. 1940.

'Love's Desire' (Lud. 1954), R; A-438, D-5A; U-4fld; 26″ h; fls. 9″ diam; coral pink (HCC-o619) and porcelain rose, reddish stripes; spr; dec. c. Ludwig & Co. 1954. PL. 14:55. 1958.

'Love Fire' (Lud.), NR; orange red.

'Lucifer' (W-WS, 1950), R; A-501; U-3fld; 19″ h; fls. 8″ diam; medium dark red. PL. 7:74. 1951.

'Lucky Strike' (Lud. 1957), R; A-443, D-5A; U-3-4fld; 24″ h; Oriental red (HCC-819), oxblood red throat; spr; dec. PL. 14:55. 1958.

'Ludwig's Ace' (Lud. 1959), R; A-540, D-5A; U-4fld; 23″ h; fls. 8″ diam; azalea pink, shaded light brick red with delft rose throat; spr. PL. 16:76. 1960.

'Ludwig's Dazzler' (Lud. 1957), R; A-439, D-5A; U-4fld; 26″ h; fls. 8½″ diam; pure white with nearly white throat; spr; dec. PL. 14:55. 1958.

'Ludwig's Goliath' (Lud. 1957), R; A-442, D-5A; U-4fld; 25″ h; fls. 11″ diam; orient red (HCC-819), darker throat; spr; dec. PL. 14:55. 1958.

'Ludwig's It' (Lud. 1958), R; A-467, D-5A; U-4fld; 30″ h; fls. 10″ diam; dark blood red (HCC-820), currant red throat; spr; dec. PL. 15:43. 1959.

'Ludwig's Masterpiece' (Lud. 1954), R; A-440, D-5A; U-4-5fld; 30″ h; fls. 8″ diam; dutch vermilion (HCC-717), darker throat; spr; dec. PL. 14:55. 1958.

'Ludwig's Scarlet' (Lud. 1950), R; A-441, D-5A; U-4fld; 25″ h; fls. 7½″ diam; dark blood red (HCC-820), darker in throat; spr; dec. PL. 14:55. 1958.

'Ludwig's Sensation' (Lud.), NR; U-4fld; 18″ h; fls. 7″ diam; white, greenish throat. Traub, Amaryll. Man. 82. 1958.

'Ludwig's Splendor' (Lud.), NR; U-4fld; fls. 8½″ diam; dutch vermilion (HCC-717), darker throat. c. Ludwig & Co. 1954.

'Lyso', R; A-224; white and red, veined green. Hb. 1:49. 1934.

—M—

'Mac Arthur' (Lud. 1954), NR; U-4fld; 30″ h; fls. 7½″ diam; dutch vermilion (HCC-717). c. Ludwig & Co. 1954.

'Madam Curie' (W-WZ. 1962), R; A-717, D-5A; U-3fld; 14″ h; fls. 6″ diam; shrimp red (HCC-616), veining in all segs. I.—Goed. 1962. PL. 19:66. 1963.

'Madam Van Waveren' (VW. 1962), R; A-736, D-5A; U-3-4fld; 28″ h; fls. 8″ diam; white, red pencil stripes in upper segs, lower segs white; spr. PL. 19:67. 1963.

'Madira Bickel' (McCann), NR; brick red, ruffled edges. Traub, Amaryll. Man. 90. 1958.

'Madonna' (Veit.), R; A-225. Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Magic', R; A-226. Chitt. 1933. I.—Holf. 1926. Hb. 1:49. 1934.

'Magnificent', R; A-227. Chitt. 1933. I.—Ker. 1909. Hb. 1:49. 1934.

'Magnolia' (BM), R; A-643, large white. PL. 17:52. 1961.

'Maiden's Blush' (Camm.), NR. PL. 10: 79. 1954.

'Major Wilson', R; A-228, D-5; dark red ground color, tips creamy white; 'Brilliant' x **A. psittacina.** Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Malay Star' (BM. 1955), R; A-644, D-5B; U-4fld; 16″ h; fls. 7½″ diam; rose opal (HCC-o22), white central star. PL. 17: 52. 1961.

'Maluti' (BM. 1959), R; A-605, D-5B; U-3fld; 21″ h; fls. 9″ diam; cardinal red (HCC-822). PL. 17:52. 1961.

'Mandarin's Joy' (BM. 1955), R; A-606, D-5B; U-4fld; 20″ h; fls. 8″ diam; mandarin red (HCC-17). PL. 17: 52. 1961.

'Mandarin's Pride' (BM. 1954), R; A-607, D-5B; U-2fld; 18″ h; fls. 7½″ diam; light mandarin red (HCC-17). PL. 17:52. 1961.

'Mansore' (VM.); NR; crimson-purple.

'Marathon', R; A-229. Chitt. 1933. I.—Veit. 1901. Hb. 1:49. 1934.

'Marcelle' (Hay. 1938), R; A-230, D-5; U-4fld; fls. 8″ diam; deep red self. Hb. 5:146. 1938.

'Marcus', R; A-231. Chitt. 1933. I.—Veit. 1909. Hb. 1:49. 1934.

'Margaret Pomfret' (Gron.), R; A-232, D-5; dark red, seg tips creamy white. cl. 'Brilliant' x **A. psittacina.** Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Margaret Rose' (Camm.), NR; PL. 10:79. 1954.

'Margaret Rose' (Lud. R; A-444, D-5A; U-4fld; 28″ h; fls. 8″-9″ diam; shrimp red (HCC-616/3) striped, mandarin red on upper segs, begonia rose on lower segs. PL. 14:55. 1958.

'Miss Margaret Truman' (Lud. 1954), R; A-446, D-5A; U-4fld; 28″ h; fls. 8″ diam; porcelain rose (HCC-620), camelia rose reflection, darker throat; spr; dec. PL. 14:55. 1958.

'Margie Clements' (Clem. 1957), R; A-401, D-7; U-4fld; 22″ h; fls. 5½″ diam; dutch vermilion (HCC-717), segs pointed and reflexed. PL.

14:54. 1958.

'Marginata', R; A-233; **A. elegans** hybrid. Bak. Amaryll. 1888. Hb. 1:49. 1934.

'Marginatum Conspicum' (V. Hou.), R; A-234. Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Marginatum Venustum' (V. Hou.), R; A-235. Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Maria Goretti' (Lud. 1950), R; A-445, D-5B; U-4fld; 24″ h; fls 9″ diam; pure white, greenish throat; spr; dec. PL. 14:55. 1958.

'Marie' (Heat. 1934), NR; U-4fld; fls. 11″ diam; pink with white markings; ev. Hb. 1:105. 1934.

'Marie Ash' (BM. 1958), R; A-608, D-5B; U-3fld; fls. 7½″ diam; scarlet (HCC-19), flushed white towards center. PL. 17:52. 1961.

'Marina' (Traub, 1936), R; A-236, D-5B; fls. 10½″ diam; white with pink markings. Hb. 3:92. 1936.

'Marion' (Pfis.), R; A-237; 'Dr. Masters' x **A. pardina.** Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Marion' (W-WS. 1962), R; A-682, D-5A; U-4fld; 23″ h; fls. 8½″ diam; ruffled white with rose pencil stripes in top petals; spr. PL. 19:65. 1963.

'Marjory', R; A-238. Chitt. 1933. I.—Holf. 1906. Hb. 1:49. 1934.

'Mars' (Hay. 1935), NR. Hb. 2:92. 1935.

'Mars', R; A-239. Chitt. 1933. I.—Paul, 1892. Hb. 1: 49. 1934.

'Mars' (VM. 1962), R; A-721, D-5A; U-4fld; 28″ h; fls. 9″ diam; currant red (HCC-821), darker throat; spr. PL. 19:67. 1963.

'Martinique' (Bur. 1909), R; A-240; fls. 9″ diam; Hb. 9:154, f. 78:153. 1942.

'Mary Davis' (Hay. 1937), R; A-241, D-5B; fls. 8″ diam; pure white, light green throat. Hb. 4: f., 106. 1937.

'Mary Davis', NR; cl. of **Amaryllis** x **gladwynsis,** which see under x **gladwyensis.** PL. 8:86. 1952.

'Maryland' (W-WS. 1962), R; A-687, D-5A; U-2-3fld; 20″ h; fls. 7½″ diam; begonia (HCC-619) shading to scarlet, lower segs begonia with white veins; spr; PL. 19:65. 1963.

'Mary McCann' (McCann), NR; D-7; delicate shade of pink, veined white, Traub, Amaryll. Man. 89, 90. 1958.

'Maryon' (Lud.), NR; U-3fld; fls. 6″ diam; dutch vermilion (HCC-717/2). PL. 10:35. 1954.

'Matopos' (BM. 1962), NR; blood red.

'Matrooskop' (BM. 1962), NR; blood red.

'McCann's Double' (McCann), R; A-242; shades of red. Hb. 9:211. 1942.

'Melanie' (BM. 1958), R; A-609, D-5B; U-4fld; 16″ h; fls. 7″ diam; scarlet (HCC-17). PL. 17:52. 1961.

'Melpomene' (Ker), R; A-243, D-5; reddish white, veined red. Hb. 1:49. 1934.

'Mendeli', NR; **A. aulica** hybrid. Bak. Amaryll. 1888. Hb. 1:49. 1934.

'Menelik' (Chandler), NR; SPN. 13. 1942.

'Mephisto', R; A-244; lilac red. Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Mephisto' (Heat. 1934), NR; syn: "War". SPN. 13. 1942.

'Meteor' (Veit.), R; A-98. Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Meteor' (BM. 1959), R; A-645, D-5B; U-3fld; 16″ h; fls. 8″ diam; vermilion (HCC-18), mandarin red influence; spr. PL. 17:52. 1961.

'Midorella' (VM.), NR; dark violet rose.

'Milton' (Veit.), R; A-99. Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Minerva' (Ker), R; A-100, D-5; red ground color, white band and white veins. Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Minerva' (VM. 1962), R; A-744, D-5A; U-4fld; 16″ h; fls. 7″ diam; delft rose (HCC-o20), pencil stripes and pinpoints delft rose; spr. PL. 19:67.

1963.

'Miss Annie' (Schm. 1962), R; A-697, D-5A; U-4fld; 18″ h; fls. 6″ diam; currant red (HCC-821); spr. UL. 19:66. 1963.

'Mme. Modjeska' (Gron.), R; A-101, D-5; dark red ground color, seg tips creamy white, greenish throat. Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Model' (Ker), R; A-102, D-5; creamy white, red stripes and veining. Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Modern Times' (VW. 1956), R; A-396; 28″ h; fls. 8″-10″ diam; deep blood red (HCC-820). PL. 14:54. 1958.

'Mohawk', R; A-680, D-5A; U-4fld; fls. 9″ diam; solid light red. I.—Goed. 1961. PL. 18:43. 1962.

'Mona Lisa' (Lud. 1948), R; 245; U-3-4fld; 15″ h; fls. 5½″ diam; salmon, suffused pink. PL. 7:72. 1951.

'Monarch', NR. Hb. 1:63. 1934.

'Mont Blanc' (Kenny, 1940), R; A-246; White. Hb. 7:132, f. 52. 1940.

'Montezuma' (Nehr.), R; A-247; 39″ h; fiery orange red with yellow star. **A. belladonna** x cl. 'Empress of India' Hb. 1:49. 1934.

'Mooiriver' (BM. 1962), NR; mandarin red with white.

'Moreno' (W-WS), R; A-502; 26″ h; fls. 8″ diam; medium dark red, tinge of rose in throat. PL. 15:45. 1959.

'Morning Kiss' (VW. 1957), R; A-409; 28″ h; fls. 8″-10″ diam; salmon pink. PL. 14:55. 1958.

'Morning Star' (Lud.), NR; U-3-4fld; 30″ h; fls. 8″ diam; begonia pink (HCC-619), white star with red ring deep in throat. c. Ludwig & Co. 1954.

'Mother' (Heat. 1934), NR; U-3-4fld; fls. 8½″ diam; dark wine red, veined rich purple; ev. Hb. 2:90. 1935.

'Mothersday' (Lud. 1950), R; A-447, D-5A; U-3-4fld; 30″ h; fls. 9″ diam; mandarin red (HCC-17), violet reflection in center, darker throat. PL. 7:74. 1951.

'Mount Blanc' (W-WZ. 1962), R; A-718, D-5A; U-2fld; 18″ h; fls. 6″ diam; pure white, segs ruffled with light green throat. I.—Goed. 1962. PL. 19:66. 1963.

'Mount Everest' (W-WS. 1962), R; A-715, D-5A; U-3fld; 20″ h; fls. 8½″ diam; blend of white, orient pink, and china rose. PL. 19:66. 1963.

'Mount Tacoma' (W-WS), R; A-503; 24″ h; fls. 7″ diam; pure white, faint green tinge in throat. PL. 15:45. 1959.

'Mozart', NR; fire red. I.—Goed. 1962 for a Dutch breeder.

'Mrs. Bilney, R; A-248; white dotted red. Nehr. Amaryll. 1909. I.—Veit. 1902. Hb. 1:49. 1934.

'Mrs. Burbank' (Bur. 1901), R; A-249; fls. 8″ diam; Hb. 9:154. 1942.

'Mrs. Carl Jay' (Jay), R; A-250. Nehr. Amaryll. 1909. Hb. 1:49. 1934.

'Mrs. Cleveland' (Pfis), R; A-251; rose red. Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'Mrs. Donald Dudley' (Heat. 1934), NR; Hb. 2:90. 1935.

'Mrs. Garfield' (Veit.), R; A-252. **A. reticulata** x cl. 'Defiance'; autm. I.—Clarke, 1928. Hb. 1:50. 1934.

'Mrs. I. W. Heaton' (Camm.), NR. PL. 10:79. 1954.

'Mrs. Lamberton' (Heat. 1934), NR; Hb. 2:90. 1935.

'Mrs. Lancaster' (Lanc. 1940), R; A-253, D-8; U-4fld; 24″ h; fls. 4″ diam; rose red, darker veining and white stripe. **A. stylosa** x **A. reticulata** striatifolia, Mrs. Garfield. Hb. 6:205. 1939.

'Mrs. Lee' (Veit.), R; A-254. **A. reticulata** hybrid; autm. Hb. 1:50. 1934.

'Mrs. Montefiore', R; A-255; white. Nehr. Amaryll. 1909. I.—Veit. 1895. Hb. 1: 50. 1934.

'Mrs. R. W. Wheeler' (T&H, 1938), R; A-256; red. Hb. 5:91. 1938.

'Mrs. T. R. Robinson' (T&H, 1938), R; A-257; pink. Hb. 5:91. 1938.

'Mrs. Wm. Lee' (Will.), R; A-258. progeny of **A. reticulata** x 'Defiance';

autm. Hb. 1:50. 1934.

'Munroi' (Col.), NR; **A. psittacina x A. belladonna.** Herb. Amaryll. 1837. Hb. 1:50. 1934.

'Murillo', R; A-259. Chitt. 1933. I.—Holf. 1899. Hb. 1:50. 1934.

'Muscatel' (HDL. 1963), R; A-766, D-5B; U-4fld; 10″ h; fls. 7″ diam; rose red (HCC-724/2), darkens slightly in throat.

'Musigny', R; A-260. Chitt. 1933. I.—Roths. 1912. Hb. 1:50. 1934.

'Mysterie' (W-WS), R; A-504; U-4fld; 20″ h; fls. 7″ diam; rose red, darker throat. PL. 15:45. 1959.

—N—

'Narcissa' (Nort. 1951), R; A-263, D-4B; U-2fld; fls. 8″ diam; medium red (M&P 42-L-1), veined and dotted darker red. PL. 7:76. 1951.

'Nautch Girl' (Chandler), NR; SPN. 13. 1942.

'Navala', R; A-261. Chitt. 1933. I.—Veit. 1898. Hb. 1:50. 1934.

'Neel' (Schm. 1962), R; A-694, D-5A; U-4fld; 20″ h; fls. 7″ diam; orient red (HCC-819), green throat. PL. 19:66. 1963.

'Nestor' (Ker), R; A-262, D-5; red with white tips. Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'Nevoso' (Hay. 1935), NR. Hb. 2:92. 1935.

'New Orleans' (BM. 1956), R; A-646, D-5A; U-3fld; 20″ h; fls. 7½″ diam; dawn pink, camelia rose, porcelain rose, begonia pink tips and white midribs. PL. 17:52. 1961.

'New Pink Pearl', R; A-264. Chitt. 1933. I.—Holf. 1926. Hb. 1:50. 1934.

'Nimrod', R; A-265. Chitt. 1933. I.—Veit. 1893. Hb. 1:50. 1934.

'Nivalis' (Lud. 1954), R; A-448, D-5B; U-3-4fld; 24″ h; fls. 8″ diam; pure white with faint greenish throat; spr; dec. PL. 14:55. 1958.

'Norma', R; A-267; shade of red and white. Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'Northern Queen' (VW. 1957), R; A-410; fls. 8″-10″ diam; 28″ h; salmon-orange, carmine-red towards center. PL. 14:55. 1958.

'Novelty', R; A-268. Chitt. 1933. I.—Paul, 1894. Hb. 1:50. 1934.

'Nysa', R; A-269. Chitt. 1933. I.—Veit. 1902. Hb. 1:50. 1934.

—O—

'Oasis' (W-WS. 1962), R; A-685, D-5B; U-3-4fld; 21″ h; fls. 7½″ diam; pure white with greenish throat; spr. PL. 19:65. 1963.

'O'Brien' (O'Bri.), NR; **A. pardina x A. reticulata**; autm. Hb. 1:50. 1934.

'Olympia', R; A-273. Chitt. 1933. I.—Veit. 1894. Hb. 1:50. 1934.

'Ophelia' (Will.), R; A-274, D-5; Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'Orange Beauty' (VW. 1960), R; A-659, D-5A; fls. 7″ diam; orange, cardinal red ribs, darker throat. PL. 17:53. 1961.

'Orangedale' (HDL. 1962), R; A-728, D-5A; U-4fld; 19″ h; fls. 6½″ diam; capsicum red (HCC-715), darker throat. I.—Goed. 1962. PL. 19:67. 1963.

'Orange Favorite' (W-WS. 1962), R; A-689, D-5A; U-3-4fld; 15″ h; fls. 6½″ diam; indian orange (HCC-713), glowing red throat; spr. PL. 19:65. 1963.

'Orange Fire' (Lud.), NR; U-4fld; fls. 8½″ diam; mandarin red (HCC-17). c. Ludwig & Co. 1954.

'Orange King' (Heat. 1934), NR; Hb. 2:90. 1935.

'Orange King' (Lud. 1948), R; A-270; fls. 8″ diam; dutch vermilion (HCC-717), brilliant red throat. Hb. 15:69. 1948. c. Ludwig & Co. 1954.

'Orange King' (W-WS. 1950), R; A-505; U-4fld; 18″ h; fls. 8″ diam; light red. PL. 15:45. 1959.

'Orange Nassau' (W-WZ. 1962), R; A-716, D-5A; U-3fld; 18″ h; fls. 7″ diam; burnt orange (HCC-o14). I.—Goed. 1962. PL. 19:66. 1963.

'Orange Perfection' (Heat. 1935). SPN. 13. 1942.

'Orange Wonder' (Lud.), NR; fls. 9″ diam; poppy red (HCC-16-16/1) to orange (HCC-12). c. Ludwig & Co. 1954.

'Orange Wonder' (W-WS. 1962), R; A-690, D-5A; U-3-4fld; 17″ h; fls. 8″ diam; indian orange (HCC-713) blending to capsicum red. PL. 19:65. 1963.

'Orchid' (Heat. 1934), NR;. Hb. 2:90. 1935.

'Oriflamme' (Sou.), R; A-271. **A. vittata** hybrid. Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'Orlando' (Heat. 1934), NR; white with light red markings. Hb. 2:56, 90. 1935.

'Orlando Salmon' (Heat. 1936), R; A-272, D-5A; light salmon, darker throat. Hb. 3:92. 1936.

'Osceola' (Tilg. 1934), NR; Hb. 2:90. 1935.

'Osiris' (VM. 1962), R; A-722, D-5A; U-4fld; 24″ h; fls. 8½″ diam; orient red (HCC-819), blood red throat. PL. 19:67. 1963.

'Otto Felix' (Dorr, 1962), R; A-700, D-5B; U-4fld; 23″ h; fls. 6½″ diam; delft rose and white, greenish throat; fr; spr. PL. 19:66. 1963.

'Ouverture', R; A-779, D-5A; U-3-4fld; 16″ h; fls. 7″ diam; white with light green throat; spr; dec. I.—Goed. 1962 for a Dutch breeder.

—P—

'Palatka' (Tilg. 1934), NR; fls. 9½″ diam; pink and white. Hb. 2:58, 90. 1935.

'Pallas' (VM. 1962), R; A-745, D-5A; U-4fld; 13″ h; fls. 8½″ diam; scarlet red pinpoints to solid color at ends of tips, greenish-white throat, color mostly in upper segs. PL. 19:67. 1963.

'Pamela' (Lud. 1960), R; A-559, D-8; U-5-6fld; 20″ h; fls. 3″ diam; capsicum red (HCC-715), uranium green star in throat. PL. 17:53. 1961.

'Paprika' (BM. 1958), R; A-610, D-5B; U-4fld; 18″ h; fls. 7½″ diam; capsicum red (HCC-715), vermilion influence. PL. 17:52. 1961.

'Pardinum', NR; Chitt. 1933. I.—Veit. 1867. Hb. 1:50. 1934.

'Pardy' (Hay. 1935), NR. Hb. 2:92. 1935.

'Parkeri' (Herb.), NR. **A. striata x A. reticulata.** Hb. 1:50. 1934.

'Parsifal' (VM. 1962), NR; bright red orange glow. I.—Goed. 1962 for a Dutch breeder.

'Peace' (Heat. 1934), NR; U-4fld; fls. 8″ diam; white with delicate pink markings; fr. Hb. 1.105. 1934.

'Peacefulness' (Lud.), R; A-449, D-5A; U-3-4fld; 28″ h; fls. 8″ diam; blood red (HCC-820), carmine red glow, dark red throat; spr; dec. PL. 14:55. 1958.

'Pearl Maiden', R; A-275. Chitt. 1933. I.—Holf. 1906. Hb. 1:50. 1934.

'Peppermint' (Lud. 1960), R; A-669, D-5A; U-4-6fld; 26″ h; fls. 8″-9″ diam; pure white, cardinal red stripes, greenish white throat; spr; dec. PL. 18:41. 1962.

'Peppy' (Lat. 1963), R; A-749, D-5A; U-3-4fld; 16″ h; fls. 6″-7″ diam; white base with geranium lake (HCC-20) stripes, more color in upper segs.

'Pera' R; A-276. Chitt. 1933. I.—Veit. 1897. Hb. 1:50. 1934.

'Personality', R; A-780, D-5B; U-4fld; 28″ h; fls. 8″ diam; vermilion (HCC-18) with darker red markings deep in throat; spr., dec. I.—Goed. 1962 for a Dutch breeder.

'Picardy' (BM. 1957), R; A-611, D-5B; U-3fld; 24″ h; fls. 9″ diam; poppy red (HCC-16), white star in center. PL. 17:52. 1961.

'Picotee' (Lud. 1958), NR; U-4-5fld; 24″ h; fls. 10″ diam; pure white, speckled with red spots, picotee edge. c. Ludwig & Co. 1958.

'Picta' R; A-277. Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'Picture' (Lud. 1958), R; A-471, D-8; U-4fld; 18″ h; fls. 4″ diam; orient red (HCC-819), white star, light red throat; spr; dec. PL. 15:44. 1959.

'Pink Azalea' (BM. 1954), R; A-612, D-5B; U-3fld; 14″ h; fls. 9″ diam; azalea pink (HCC-618). PL. 17:52. 1961.

'Pink Beauty' (Ker), R; A-278, D-5; light red rose with white star. Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'Pink Beauty' (W-WS. 1962), R; A-719, D-5A; U-3-4fld; 20″ h; fls. 7″ diam; rose pink (HCC-427) with white upper 3 segs, lower segs white with orient pink (416/3). PL. 19:66. 1963.

'Pink Blossom', R; A-279. Chitt. 1933. I.—Holf. 1925. Hb. 1:50. 1934.

'Pink Favorite' (Lud. 1948), R; A-280; pure pink. Hb. 15:69. 1948.

'Pink Favorite' (Lud. 1958), R; A-450, D-5B; U-3-4fld; 30″ h; fls. 9″ diam; camelia rose (HCC-622), tips lighter rose, darker throat; spr; dec. PL. 14:55. 1958.

'Pinkie', R; A-281. Chitt. 1933. I.—Holf. 1909. Hb. 1:50. 1934.

'Pink Pearl' (Whe. 1940), R; A-282, D-5A; fls. 8″ diam; pure pink, darker pink in throat with pale green. Hb. 7:130. 1940.

'Pink Pearl' (Ker), R; A-283, D-5; red rose. Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'Pink Perfection' (Lud. 1950), R; A-451, D-5A; U-4fld; 28″ h; fls. 8″ diam; rose opal (HCC-o22), carmine rose tips, PL. 14:55. 1958.

'Pink Reflection' (BM. 1955), R; A-647, D-5B; U-3fld; 17″ h; fls. 7½″ diam; camelia rose, crimson, rose opal, with white. PL. 17:52. 1961.

'Pinksterflower' (Lud. 1954), R; A-452, D-5A; U-4-5fld; 27″ h; fls. 8″ diam; azalea pink (HCC-618), poppy red reflection; spr; dec. PL. 14:55. 1958.

'Pink Tipped' (Zeiner), NR; frosted ground color. Hb. 11:256. 1944.

'Pinzoon', R; A-284; deep scarlet red. Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'Piquant', R; A-781, D-5A; U-4-5fld; 25″ h; fls. 7″ diam; dutch vermilion (HCC-717) on white base, lower segs almost white, white border on all segs; spr., dec. I.—Goed. 1962 for a Dutch breeder.

'Pirlotti' (H & S), R; A-285. Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'Pixie' (Lud. 1960), R; A-560, D-8; U-5-6fld; 22″ h; fls. 2½″ diam; orange (HCC-12), lighter towards base, greenish throat. PL. 17:54. 1961.

'Polar Light' (VW. 1962), R; A-738, D-5A; U-4fld; 14″ h; fls. 6″-7″ diam; dazzling white, pale green throat. PL. 19:67. 1963.

'Pola Negri' (VW. 1962), R; A-737, D-5A; U-3-4fld; 17″ h; fls. 7″-8″ diam; indian lake red (HCC-826). PL. 19:67. 1963.

'Polar Night' (VW. 1960), R; A-665, D-5A; U-2-3fld; 20″ h; fls. 7″ diam; snow white, green luster and green throat. PL. 17:53. 1961.

'Polly Anderson' (BM. 1962), NR; brick red to shrimp red.

'Pomona' (Bur. 1913), R; A-286; U-4-7fld; fls. 7½″ diam; fiery blooms, narrow white stripe to 4 segs. Hb. 9:154. 1942.

'Portola' (Bur. 1913), R; A-287; U-4fld; fls. 9″ diam; pure white, ground-lined and flaked carmine. Hb. 9:154. 1942.

'Poussin' (VW. 1960), R; A-660, D-5A; U-3-4fld; 22″ h; wine red with satin finish, crimson throat. PL. 17:53. 1961.

'Praeclara', R; A-289. A reticulatum hybrid. Bak. Amaryll. 1888. Hb. 1:50. 1934.

'President Benes' (Vas. 1940), R; A-290; fls. 7″ diam; stoplight shade of red. Hb. 6:155. 1940.

'President Carnot', R; A-291. Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'President Roosevelt' (Heat. 1934), NR; orange red, white star in center. Hb. 2:90, f.:55. 1935.

'Pretoria' (S.-Afr. NH, 1947), R; A-292. Hb. pl. p. 21. 1945 (1947).

'Priam' (Whe. 1940), R; A-293, D-5A; fls. 8″-9″ diam; light red on salmon. Hb. 7:130. 1940.

'Prima Donna' (Lud. 1959), R; A-541, D-5A; U-4fld; 28″ h; fls. 9″ diam; begonia rose (HCC-619), azalea pink and rosey red throat; spr; dec. PL. 16:76. 1960.

'Prince Edward', R; A-294. Chitt. 1933. I.—Veit. 1895. Hb. 1:50. 1934.

'Prince of Orange' (V. Hou.), R; A-295. Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'Prince of Orange' (W-WS), R; A-506; U-3-4fld; 19″ h; fls. 8″ diam; orange, blending to scarlet in throat. PL. 15:45. 1959.

'Princess Elizabeth' (T & H, 1937). R; A-296, D-4B; U-3fld; 27″ h; fls. 7″ diam; brilliant coronation red, greenish-white star, royal purple penciling at base of petals. Hb. 4:143. 1937.

'Princess Elizabeth' (Camm.), NR; PL. 10:79. 1954.

'Princess Osra', R; A-297. Chitt. 1933. I.—Holf. 1898. Hb. 1:50. 1934.

'Prins Willem' (BM. 1954), R; A-163, D-5B; U-2fld; 18″ h; fls. 8½″ diam; burnt orange (HCC-oo14), salmon and begonia, flush of cream. PL. 17:52. 1961.

'Prof. Koch', R; A-298. Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'Progress' (Ker), R; A-299, D-5; shining red. Hb. 1:50. 1934.

'Profusion' (Bur. 1903), R; A-288; **A. vittata x a. johnsonii** Hb. 9:154. 1942.

'Progress', NR. Hb. 1:63. 1934.

'Pulcherrima' (Garr. 1850), R; A-300; **A. aulica x a. johnsonii**; syn: **A. xacramanii pulcherrima.** Hb. 1:46. 1934.

'Pulchrum', NR. Chitt. 1933. I.—Veit. 1873, Hb. 1:50. 1934.

'Puniceum Ignescens', R; A-301. Chitt. 1933, I.—Preston, 1928. Hb. 1:50. 1934.

'Pure Pink' (VW. 1960), R; A-661, D-5A; fls. 7″ diam; dark pink, carmine red ribs and throat. PL. 17:53. 1961.

'Purity', R; A-302. I.—Burns, 1908. Hb. 1:50. 1934.

'Purity' (Hay. 1935), NR. Hb. 2:92. 1935.

'Purple Queen' (VM. 1949), R; A-527, D-4; fls. 7″ diam; dark red to purple. PL. 15:46. 1959.

—Q—

'Queen Alexandra', R; A-304. Chitt. 1933. I.—Veit. 1902. Hb. 1:50 1934.

'Queen Mary', R; A-305. Chitt. 1933. I.—Ker, 1911. Hb. 1:50. 1934.

'Queen of Scarlets' (VW), R; A-411; U-4-5fld; 24″ h; fls. 8″ diam; brilliant scarlet. PL. 14:55. 1958.

'Queen of Sheba' (Whe. 1942), R; A-306, D-5A; salmon red shading to darker tones in throat. Hb. 9:123. 1942.

'Queen of Sheba' (VM. 1958), R; A-528; 24″ h; fls. 7½″ diam; pink, darker shade in throat. PL. 15:47. 1959.

'Queen of Spots' (Bon.), R; A-303; **A. pardina** hybrid. Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'Queen of the Pinks' (VM. 1957), R; A-530; 24″ h; fls. 7″ diam; soft camelia pink. PL. 15:47. 1959.

'Queen of the Whites, (W-WS), R; A-507; U-4-5fld; 25″ h; fls. 9″ diam; waxy-white, faint green tint in throat. PL. 15:45. 1959.

'Queen Rose' (VM), R; A-531; 24″ h; fls. 7″ diam; light red to rose white, star in center. PL. 15:46. 1959.

'Queen's Page' (W-WS.), R; A-508; U-4fld; 20″ h; fls. 8″ diam; salmon orange. PL. 7:72., f. 13:73. 1951.

'Queen Superiora' (VM. 1948), R; A-529; 22″ h; fls. 7″ diam; dark red. PL. 10: f. 10:71. 1954. PL. 15:47. 1959.

—R—

Radiance' (BM. 1959), R; A-614, D-5B; U-2fld; 18″ h; 7½″ diam; deep bright scarlet (HCC-19). PL. 17:52. 1961.

'Ralph Wheeler' (Heat. 1934), NR. Hb. 2:90. 1935.

'Ray V. Denslow' (Lud.), NR; U-4fld; 30″ h; fls. 7½″ diam; capsicum red (HCC-715), darker throat. c. Ludwig & Co. 1954.

'Reba Cooper' (T & H, 1938), R; A-307; pink. Hb. 5:91. 1938.

'Red Champion' (VW), R; A-112; U-4fld; 22″ h; fls. 8″-9″ diam; brilliant red. PL. 14:55. 1958.

'Red Emperor' (Heat. 1935), NR. SPN. 13. 1942.

'Red Emperor' (VM), NR; clear red.

'Red Guard' (Lud. 1948), R; A-308; beautiful red. Hb. 15:69. 1948.

'Red Guard' (VW), R; A-413; U-4-5fld; 24″ h; fls. 9″ diam; deep scarlet. PL. 14:55. 1958.

'Red Lion' (VW), R; A-414; U-4fld; 22″ h; fls. 8″ diam; dark red. PL. 14:55. 1958.

'Red Majesty' (W-WS. 1955), R; A-550, D-5A; 24″ h; fls. 10″ diam; red with frosty sheen; spr; dec. PL. 16:76. 1960.

'Red Master' (W-WS. 1950), R; A-551, D-5A; U-2-3fld; 24″ h; fls. 11″-12″ diam; dark red; spr; dec. PL. 16:76. 1960.

'Red Shank' (VW. 1963), R; A-772. Red.

'Red Sparkle' (Lud.), NR; U-3-4fld; 34″ h; fls. 9″ diam; dutch vermilion (HCC-717), darker throat; la. spr; dec. c. Ludwig & Co. 1954.

'Red Sunset' (Heat. 1936), R; A-309, D-5A; blood red, veined with darker keel. Hb. 3:92. 1936.

'Red Wing' (Heat. 1934), R; A-310, Hb. 2:90. 1935.

'Rembrandt' (VM. 1962), R; A-751, D-5A; U-4fld; 16″ h; fls. 7″ diam; signal red (HCC-719), glossy throat. I.—Goed. 1962.

'Rex' (Arms. 1945), R; A-311, D-5B; fls. 9″ diam; dark red, light green star in center. Hb. 12:104. 1945.

'Rialto', R: 312. Chitt. 1933. I.—Veit. 1901. Hb. 1:50. 1934.

'Rilona' (VM. 1962), R; A-723, D-5B; U-4-6fld; 23″ h; fls. 8″ diam; shrimp red (HCC-616/1), darker shade in throat. PL. 19:67. 1963.

'Robespierre' (BM. 1954), R; A-615, D-5B; U-3fld; 18″ h; fls. 9″ diam; white with delft rose brushing. PL. 17:52. 1961.

'Robin', R; A-313. Chitt. I.—Holf. 1899. Hb. 1:50. 1934.

'Rocket' (HDL. 1963), R; A-767, D-5A; U-3-4fld; 12″ h; fls. 7″ diam; rose red (HCC-724/1), purple tinge, green throat blending to white midrib halfway up segs. I.—Goed. 1963.

'Ronda', R; A-314; white ground with little red. Nehr. Amaryll. 1909. I. Veit. 1904. Hb. 1:50. 1934.

'Rosalind', R; A-315. Chitt. 1933. I.—Veit. 1896. Hb. 1:50. 1934.

'Rosaline' (HDL. 1962), R; A-729, D-5A; U-2fld; 19½″ h; fls. 7½″ diam; mottled magenta rose (HCCo27/3). I.—Goed. 1962. PL. 19:67. 1963.

'Rose Beauty' (VW. 1960), R; A-662, D-5A; U-3fld; fls. 7″ diam; cyclamen rose with crimson red blotch in throat. PL. 17:53. 1961.

'Rosedale' (HDL. 1963), R; A-768, D-5A; U-2-4fld; 11″ h; fls. 6″ diam; turkey red (HCC-721), darker in throat. I.—Goed. 1963.

'Rose du Barry', R; A-316. Chitt. 1933. I.—Roths. 1912. Hb. 1:50. 1934.

'Rose Lace' (BM. 1955), R; A-616, D-5A; U-4fld; 20″ h; fls. 7½″ diam; rose madder (HCC-23), white star along midribs. PL. 17:52. 1961.

'Roselinde' (Lud.), R; A-453; U-3-4fld; 22″ h; fls. 7″ diam; carmine rose (HCC-621-621/1), greenish-white throat. c. Ludwig & Co. 1954.

'Rose Madder', R; A-319. Chitt. 1933. I.—Ker. 1906. Hb. 1:50. 1934.

'Rosemarie' (Heat.), NR; light red, yellowish star. Hb. 2:56. 1935.

'Rose Marie' (Arms. 1945), R; A-317, D-5B; fls. 9″ diam; pink, white throat white midrib halfway up segs. Hb. 12:104. 1947.

'Rose Marie' (VM. 1962), R; A-724, D-5A; U-4-5fld; 24″ h; fls. 8″ diam; carmine rose (HCC-621), light midrib halfway up segs. PL. 19:67. 1963.

'Rosemary', R; A-318. Chitt. 1933. I.—Roths. 1931. Hb. 1:50. 1934.

'Rose Perfection' (Ker), R; A-320, D-5; rose red. Hb. 1:50. 1934.

'Rose Queen' (VW. 1949), R; A-415; U-3-4fld; 24″ h; fls. 8″ diam; old rose, darker throat. PL. 14:55. 1958.

'Rose Violet' (VM), NR; purplish violet.

'Rossini' (Lud.), R; A-454, D-5A; U-2-3fld; 26″ h; fls. 7½″ diam; carmine rose (HCC-21) with neyron rose (623) seg tips, darker shade in throat; spr; dec. c. Ludwig & Co. 1954.

'Rostenli' (VM.), NR; white center with pink edge.

'Rosy Cloud' (VW. 1960), R; A-663, D-5A; U-4fld; 18″ h; fls. 8″ diam; pearl pink, darker ribs, center of segs flushed carmine, green and white throat. PL. 17:53. 1961.

'Rosy Dawn', R; A-782, D-5A; U-4fld; 18″ h; fls. 7″ diam; carmine rose (HCC-621), darker shade in throat; spr., dec. I.—Goed. for a Dutch breeder.

'Rotterdam' (W-WS. 1962), R; A692, D-5A; U-4fld; 20″ h; fls. 7″ to 8″ diam; currant red (HCC-821/2) to (821) in throat. PL. 19:65. 1963.

'Rouge' (Vas. 1936), R; A-321, D-5B; deep red. Hb. 3:92. 1936.

'Royal Dutch' (Lud. 1961), R; A-670, D-5A; U-4fld; 24″ h; fls. 7″-8″ diam; tips orient red (HCC-818/1) changing to light scarlet inwards to pure white and greenish in throat. PL. 18:41. 1962.

'Royal Garnet' (Whe. 1940), R; A-322, D-5A; fls. 7½″ diam; dark red, darker throat, satiny appearance, Hb. 7:130. 1940.

'Royal Ruby' (W-WS. 1959), R; A-552, D-5A; U-4fld; 28″ h; fls. 9″ diam; brilliant medium red. PL. 16:76. 1960.

'Royal Standard' (Veit.), R; A-323. Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'Royal Velvet' (VW. 1956), R; A-394; U-3-4fld; 24″ h; fls. 8″ diam; deep red to purple. PL. 14:54. 1958.

'R. P. Pitcher' (Will.), R; A-324; cl. 'Defiance' x **A. reticulata**; autm. Nehr. Amaryll. 1909. Hb. 1:50. 1934.

'Ruby', R; A-325. Chitt. 1933. I.—Schr. 1931. Hb. 1:51. 1934.

'Ruby' (Hay. 1935), NR. Hb. 2:92. 1935.

'Ruby' (Zeiner, 1946), R; A-326, D-5A; fls. 6½″ diam; dark ruby red. Hb. 13:110. 1946.

'Ruby Gem' (Ker), R; A-327, D-5; ruby red. Hb. 1:51. 1934.

'Ruby Glow' (HDL. 1962), R; A-730, D-5A; U-4fld; 19″ h; fls. 6″ diam; geranium lake (HCC-20) with ruby red throat. I.—Goed. 1962. PL. 19:67. 1963.

'Ruby Supreme', NR. Hb. 9:211. 1942.

'Ruth' (Pfis), R; A-328; cl. 'Dr. Masters' x **A. pardina.** Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Ruth' (Chandler), NR. SPN. 13. 1942.

—S—

'Safari' (HDL. 1963), R; A-761, D-5B; U-3-4fld; 12″ h; fls. 6½″ diam; orient red (HCC-819), darker throat. I.—VZ. 1963.

'Salisbury' (Brn. 1943), R; A-329; fls. 8″ diam; red lines on light background. Hb. 10:94. 1943.

'Salmon Beauty' (Heat. 1935), NR; SPN. 13. 1942.

'Salmon Beauty' (VW. 1956), R; A-395; U-4fld; 20″ h; fls. 8″ diam; salmon pink. PL. 14:54. 1958.

'Salmonea' (VW), R; A-417; U-4fld; 24″ h; fls. 8″-9″ diam; delicate light pink. PL. 14:55. 1958.

'Salmonette' (W-WS), R; A-509; U-4-6fld; 24″ h; fls. 8″ diam; clear salmon, darker throat. PL. 15:45. 1959.

'Salmon Giant' (VW), R; A-416; 28″ h; fls. 8″-10″ diam; coppery salmon pink. PL. 14:55. 1958.

'Salmon Joy' (Lud. 1948), R; A-330; U-4fld; 22″ h; fls. 9″ diam; salmon scarlet blending to deep red. PL. 7:72, f. 13:73. 1951.

'Salmon Joy' (Lud.), R; A-445, D-5A; U-3-4fld; 30″ fls. 8½″ diam; mandarin red (HCC-17/1), darker red throat; spr; dec. PL. 14:55. 1958.

'Salmon Queen' (Hay. 1935), NR. Hb. 2:92, f. :91. 1935.

'Salmon Queen' (Camm.), NR. PL. 10:79. 1954.

'Salmon Streak' (Zeiner, 1945), R; A-331, D-4B; fls. 6″ diam; salmon

with white stripe in center of each seg. Hb. 12:104. 1945.

'Salmon Supreme' (Zeiner, 1945), R; A-332, D-5B; fls. 6½″ diam; salmon colored. Hb. 12:104. 1945.

'Salome' (BM. 1962), NR; azalea pink, salmon pink, and shrimp red, cream bordered.

'Salvator Rosa', R; A-333. Chitt. 1933. I.—Paul, 1893. Hb. 1:51. 1934.

'Sappho' (Ker), R; A-334. D-5; carmine red. Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Sarah Cole' (T & H. 1938), R; A-335; pink. Hb. 5:91. 1938.

'Sarong' (BM. 1954), R; A-617, D-5B; U-3fld; 26″ h; fls. 9″ diam; dutch vermilion (HCC-717). PL. 17:52. 1961.

'Scarlet Beauty' (W-WS), R; A-510; U-4fld; fls. 9″ diam; 24″ h; scarlet to medium red, darker throat. PL. 15:45. 1959.

'Scarlet Gem' (Ker), R; A-336, D-5; pure brilliant scarlet red. Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Scarlet Globe' (VW. 1962), R; A-739, D-5A; U-3-4fld; 24″ h; fls. 6″-7½″ diam; scarlet red (HCC-19/1). PL. 19:67. 1963.

'Scarlet King' (Chandler), NR; SPN. 13. 1942.

'Scarlet Leader' (Lud. 1948), R; A-337; U-4fld; 22″ h; fls. 7″ diam; scarlet, suffused with red, darker throat. Hb. 15:69. 1948.

'Scarlet Leader' (VW), R; A-418; U-4fld; 28″ h; fls. 8″-10″ diam; scarlet red, darker red spot in throat. PL. 14:55. 1958.

'Scarlet O'Hara' (BM. 1958), R; A-618, D-5A; U-4fld; 24″ h; fls. 9″ diam; scarlet on white base and midribs. PL. 17:52. 1961.

'Scarlet Pimpernel' (VW), R; A-419; U-4fld; 26″ h; fls. 8″-9″ diam; pure scarlet self. PL. 14:55. 1958.

'Scarlet Queen' (Chandler), NR. SPN. 13. 1942.

'Scarlet Triumph' (W-WS), R; A-511; U-4fld; fls. 10″ diam; clear scarlet, nearly light red. PL. 15:45. 1959.

'Schubert' (BM. 1958), R; A-648, D-5B; U-3fld; 18″ h; fls. 9″ diam; azalea pink (HCC-618), vermilion, and white midribs. PL. 17:52. 1961.

'Scotty's White' (Dorr, 1962), R; A-699, D-5A; U-4fld; 18″ h; fls. 6″ diam; white with greenish tint. PL. 19:66. 1963.

'Sea Nymph', R; A-338. Chitt. 1933. I.—Paul, 1899. Hb. 1:51. 1934.

'Selma' (VM), NR; salmon.

'Seminola' (Hay. 1938), R; A-339; U-3fld; fls. 7″-8″ diam; dark red self. Hb. 5:146. 1938.

'Senator Wallace' (VW. 1958), R; A-420; U-4fld; 24″ h; fls. 8″ diam; rose, shaded white. PL. 14:55. 1958.

'Senorita', NR; **a. evansiae x A. striata**; pink changing to soft pink as the flower ages, chartreuse star in throat. c. Claude W. Davis. 1962.

'Sensation' (Cron. 1960), R; A-652, D-5A; U-4fld; 24″ h; fls. 10″-11″ diam; white, rose madder border. Mead strain pink x 'White Dazzler'. PL. 17:51. 1961.

Seraph', R; A-340; lilac red, white, white star and streaks. Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Seraphis', R; A-341; lilac red, white stripes. Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Serapis II' (Heat. 1934), NR. Hb. 2:90. 1935.

'Seymouri' (Herb.), NR; **A. aulica x A. vittata.** Hb. 1:51. 1934.

'Shakespeare' (Lud.), R; A-456, D-5A; U-4fld; 26″ h; fls. 8″ diam; dark orient red (HCC-819), dark red throat; spr; dec. c. Ludwig & Co. 1954.

'Shepherdess' (BM. 1957), R; A-619, D-5B; U-3fld; 16″ h; fls. 7″ diam; delft rose (HCC-o20), carmine rose influence. PL. 17:52. 1961.

'Show Boat' (BM. 1962), NR; orient red.

'Show Girl' (Lud.), NR; U-4fld; fls. 8″ diam; turkey red (HCC-721), dark blood red (HCC-820) in throat. c. Ludwig & Co. 1954.

'Siam' (BM. 1962), NR; azalea pink, soft white center.

'Sibyl Houdyshel' (Houd. 1934), R; A-342; white, narrow pink line on border, flushed and lined pink in throat; fr. Hb. 9:211. 1943.

'Sight Show' (Lud. 1961), R; A-671, D-5A; U-4fld; 26″ h; fls. 8″-9″

diam; porcelain rose to carmine rose, darker throat. PL. 18:41. 1962.

'Signal Hill' (BM. 1954), R; A-620, D-5B; U-3fld; 18" h; fls. 7½" diam; signal red (HCC-719), white central star. PL. 17:52. 1961.

'Silver Halo' (Ram. 1959), R; A-546, D-5A; 22" h; fls. 6½" diam; scarlet (HCC-19), white throat, ⅛" silver edge on margins; spr; dec. PL. 16:76. 1960.

'Silver Lining' (Lud. 1956), R; A-458, D-5A; U-4-5fld; 28" h; fls. 9"-10" diam; red and white striped, segs white edged, spr; dec. PL. 14:55. 1958.

'Silver Queen', R; A-343. Chitt. 1933. I.—Paul, 1892. Hb. 1:51. 1934.

'Singapore' (BM), R; A-621; orient red. PL. 17:52. 1961.

'Sir Christopher Wren', R; A-344. Chitt. 1933. I.—Holf. 1902. Hb. 1:51. 1934.

'Siren' (Lud. 1953), R; A-459, D-5A; U-4fld; 27" h; fls. 8"-9" diam; salmon rose violet shaded, lighter in center of segs. PL. 14:55. 1958.

'Sir William', R; A-345. Chitt. 1933. I.—RBG, Kew, 1899. Hb. 1:51. 1934.

'Skilwag' (BM, 1956), R; A-622, D-5B; U-3-4fld; 15" h; fls. 8½" diam; deep vermilion (HCC-18). PL. 17:52. 1961.

'Smollet', R; A-346; scarlet red, darker in center. Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Snowdon' (Fiel.), R; A-347, D-5; white. Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Snow King' (Ker), R; A-348, D-5; pure white. Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Snow Man' (VW. 1950), R; A-664, D-5; fls. 6" diam; snow white with green throat; fr. PL. 17:53. 1961.

'Snow Queen' (Lud. 1948), R; A-349; U-4fld; 18" h; fls. 7½" diam; pure white; e. spr. c. Ludwig & Co. 1954. Hb. 15:69. 1948.

'Snowstorm' (VW. 1956), NR; U-2-3fld; 20" h; fls. 7" diam; pure white, green lustre and green throat. PL. 14:54. 1958.

'Socrates' R; A-350. Chitt. 1933. I.—Veit. 1898. Hb. 1:51. 1934.

'Solina' (VM), NR; salmon orange.

'Sonia' (Vas. 1940), R; A-351; red, white keels. Hb. 6:155. 1940.

'Sorita' (VM), NR; salmon.

'Southey', R; A-352. Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Speciosa' (Ker), R; A-353, D-5; edges and tips white, middle deep red. Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Spectabile', R; A-354; reginae hybrid. Bak. Amaryll. 1888. Hb. 1:51. 1934.

'Spectabilis' (Ker), R; A-355, D-5; red, tips, white. Hb. 1:51. 1934.

'Speculum', R; A-356. Chitt. 1933. I.—Veit. 1894. Hb. 1:51. 1934.

'Splendidum' (Herb. 1824), R; A-357; **A. vittata x A. reginae** Hb. 1:51. 1934.

'Spofforthiae' (Herb.), R; A-358; **A. aulica** x 'Carnarvoni'. Hb. 1:51. 1934.

'Spot' (Zeiner, 1945), R; A-359, D-5B; fls. 7" diam; pure white, with a few pink spots. Hb. 12:104. 1945.

'Spotted Angelina' (Bon. 1909), R; A-360; **A. pardina** hybrid. Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Spotted Orfeo' (Bon.), R; A-361. Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Spring Butterfly' (BM. 1957), R; A-623, D-5B; U-3fld; 24" h; fls. 7" diam; white, flushed scarlet and picotee edge. PL. 17:52. 1961.

'Spring Dream' (Lud. 1959), R; A-542, D-5A; U-4fld; 25" h; fls. 7"-8" diam; delft rose (HCC-o20/1), rosy red glossy throat. PL. 16:76. 1960.

'Springsong' (Ram. 1959), R; A-547, D-5A; 22" h; fls. 7½" diam; oriental red (HCC-819), white star in throat; spr. PL. 16:76. 1960.

'Square Dance' (Lud. 1962), R; A-704, D-5A; U-4fld; 28" h; fls. 9"-10" diam; picotee novelty, red edge on each white seg, green throat. PL. 19:65. 1963.

'St. James' (VM), NR; deep red.

'Stained Glass' (BM. 1954), R; A-649, D-5A; U-2fld; 20″ h; fls. 8″ diam; porcelain rose (HCC-620), with white. PL. 17:52. 1961.

'Stansted' (Chal. 1935), NR; fls. 13″ diam; pure white. SPN. 13. 1942.

'Star Burst' (Muns. 1963), R; A-753, D-7; U-2-3fld; 20″ h; fls. 4″ diam; azalea pink (HCC-618) and begonia pink (619), pale green throat blending to white 1/3 of segs.

'Star of Bethlehem' (W-WS), R; A-512; 24″ h; fls. 3½″ diam; salmon pink, white towards margins forming a star. PL. 15:45. 1959.

'Star of India', R; A-362; dark red, broad white bands. Hb. 1:51. 1934.

'Stella' (Dug. 1957), R; A-403, D-7; 22″ h; fls. 7″ diam; geranium lake (HCC-20), darker in throat. PL. 14:54. 1958.

'Stratford' (BM. 1962), NR; light and dark azalea, changing to porcelain rose.

'Strawberry Glow' (Hay. 1935), NR; Hb. 2:92. 1935.

'Streaking Stripes' (Lud. 1962), R; A-705, D-5A; U-4fld; 28″ h; fls. 8″-9″ diam; pure white with mandarin red stripes, greenish throat. PL. 19:65. 1963.

'Striped Beauty' (W-WS), R; A-513; U-3-4fld; 20″ h; fls. 6″ diam; white, orange scarlet bands. PL. 15:45. 1959.

'Striped Superiora' (VM), NR; descr. lacking.

'Summer Rose' (Zeiner, 1944), R; A-363; fls. 8″ diam; rose with white stripe. Hb. 11:266. 1944.

'Sunburst' (HDL. 1963), R; A-769, D-5B; U-4fld; 10″ h; fls. 6½″ diam; white, carmine red stripes, less color in lower segs, greenish-white throat. I.—Goed. 1963.

'Sunrise' (Whe. 1940), R; A-364; light red, darker to throat. Hb. 7:130. 1940.

'Sunset' (Heat. 1934), NR; Hb. 2:90. 1935.

'Sunset' (Zeiner, 1945), R; A-365, D-4B; orange, white midrib. Hb. 12:104. 1945.

'Superba' (VM), NR; bordeaux red.

'Susan Hough' (Whe. 1940), R; A-366, D-4A; old rose, 4-I-2, lighter on outside and center of segs, darker in center of flower. Hb. 7:130. 1940.

'Susie Pink' (Gasp. 1958), R; A-398, D-5A; 28″ h; fls. 7½″ diam; rose madder (HCC-23), light greenish throat; fr.; spr. PL. 14:54. 1958.

'Swahili' (HDL. 1963), R; A-762, D-5A; U-4fld; 16″ h; fls. 7″ diam; dutch vermilion (HCC-717), slightly darker throat. I.—VZ. 1963.

'Sweetii' (Sweet), NR; **A. reticulata** x **A. johnsonii.** Herb. Amaryll. 1837. Hb. 1:51. 1934.

'Sweet Seventeen' (W-WS), R; A-514; U-4fld; 20″ h; fls. 9″ diam; salmon rose on white, flesh pink in throat. PL. 15:45. 1959.

'Sylvannus', R; A-367. Chitt. 1933. I.—Veit. 1902. Hb. 1:51. 1934.

'Sylvia' (Veit), R; A-368; **A. reticulata** x **A. leopoldii;** autm. Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Symphony' (Lud. 1960), R; A-557, D-5A; U-4fld; 26″ h; fls. 8½″ diam; delft rose (HCC-o20), darker throat. PL. 17:53. 1961.

'Syren', R; A-369; clear rose. Nehr. Amaryll. 1909. I.—Veit. 1893. Hb. 1:51. 1934.

—T—

'Tacola', R; A-370. Chitt. 1933. I.—Veit. 1898. Hb. 1:51. 1934.

'Talisman Cove' (Fitch), R; A-672, D-5A; U-4-5fld; 27″ h; 7″-8″ diam; rose madder (HCC-23/1) to rose bengal (HCC-25/1) in throat. PL. 18:42. 1962.

'Tangerine' (HDL. 1962), R; A-731, D-5A; U-4fld; fls. 6″ diam; bright and clear delft rose (HCC-o20). I.—Goed. 1962. PL. 19:67. 1963.

'Tartan' (Camm.), NR. PL. 10:79. 1954.

'Telemus', R; A-371; white, veined lilac red. Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Television' (W-WS. 1962), R; A-691, D-5A; U-4-5fld; 20″ h; fls. 6½″ diam; french rose (HCC-520) blended with white, porcelain rose in upper segs. PL. 19:65. 1963.

'Telstar' (VW. 1962), R; A-740, D-5A; U-3-4fld; 12″ h; fls. 7″ diam; solferina purple (HCC-26). PL. 19:67. 1963.

'Terra Cotto' (HDL. 1962), R; A-732, D-5A; U-4fld; fls. 6″ diam; bright vermilion (HCC-18). I.—Goed. 1962. PL. 19:67. 1963.

'Tettaui', NR; form of **A. aulica robusta.** Hb. 1:51. 1934.

'Thaba Nchu' (BM. 1958), R; A-624, D-5B; U-3fld; 20″ h; fls. 8½″ diam; blood red (HCC-820). PL. 17:52. 1961.

'Thalia' (VM. 1962), R; A-746, D-5A; U-3-4fld; 12″ h; fls. 7½″ diam; azalea pink (HCC-618/1) on white base and border, greenish throat. PL. 19:67. 1963.

'The Bride', R; A-372. Chitt. 1933. I.—Holf. 1926. Hb. 1:51. 1934.

'The Champion', R; A-373. Chitt. 1933. I.—Veit. 1890. Hb. 1:51. 1934.

'The Czar', R; A-374. Chitt. 1933. I.—Holf. 1897. Hb. 1:51. 1934.

'The Fortress' (BM. 1958), R; A-625. D-5B; U-2fld; 14″ h; fls. 9″ diam; brick red (HCC-o16), short white midribs. PL. 17:52. 1961.

'The Hon. W. F. D. Smith', R; A-375. Chitt. 1933. I.—Hamb. 1893. Hb. 1:51. 1934.

'Theodore L. Mead' (Heat. 1934). Hb. 2:90. 1935.

'The Pirate' (BM. 1954), R; A-650, D-5B; U-4fld; 20″ h; fls. 8″ diam; blood red with white star and white flushing. PL. 17:52. 1961.

'The Queen' (W-WS), NR; cerise.

'The Rebel' (BM. 1955), R; A-626, D-5B; U-4fld; 26″ h; fls. 8″ diam; scarlet, flushed white. PL. 17:52. 1961.

'The Schooner' (BM. 1958), R; A-627, D-5B; U-2fld; 16″ h; fls. 9″ diam; azalea pink (HCC-618), flushed creamy white. PL. 17:52. 1961.

'The Vigil', R; A-376; white striped red. Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Thornkill' (Whe. 1940), R; A-377, D.5A; medium dark red, darker throat. Hb. 7:131. 1940.

'Thriller' (Lud.), NR; orient red.

'Thunberg' R; A-378; Chitt. 1933; I.—Veit. 1897. Hb. 1:51. 1934.

'Time Signal' (BM. 1958), R; A-628, D-5B; U-3fld; 18″ h; fls. 8″ diam; signal red (HCC-719). PL. 17:52. 1961.

'Timmy' (Cal. 1958), R; A-404, D-5B; 26″ h; fls. 5½″ diam; cherry red (HCC-722) seg margins whitish, faint white mid-stripe; fr. PL. 14.55. 1958.

'Tippy' (Zeiner, 1946), R; A-379, D-4B; fls. 4½″ diam; white with salmon stripes. Hb. 13:110. 1946.

'Titan', R; A-380. Chitt. 1933. I.—Veit. 1900. Hb. 1:51. 1934.

'Topaz', R; A-381; orange red, border and striped white. Nehr. Amaryll. 1909. Hb. 1:51. 1934.

'Topscore' (W-C, 1962), R; A-727, D-5A; U-4fld; 15″ h; fls. 7½″ diam; signal red (HCC-719/1), glossy blood red throat; spr. PL. 19:67. 1963.

'Traffic Stop' (Lud. 1958), R; A-468, D-5A; U-4fld; 25″ h; fls. 8½″ diam; capsicum red (HCC-715), slightly darker throat; spr; dec. PL. 15:44. 1959.

'Triple Treat' (Zeiner, 1944), R; A-382; fls. 6″ diam; scarlet to rose, white midrib. Hb. 11:266. 1944.

'Tristan' (VM. 1955), R; A-532; 24″ h; fls. 8″ diam, dark purple red. PL. 15:47. 1959.

'Trixie' (Lud. 1962), R; A-706, D-5A; U-4fld; 24″ h; fls. 8″-9″ diam; cherry red (HCC-722/2) to tyrian rose (24/1/2), darker throat. PL. 19:65. 1963.

'Tropical Sunset' (Ram. 1959), R; A-548, D-5A; 26″ h; fls. 7″ diam; signal red (HCC-719), white throat and red spots; spr; dec. PL. 16:76. 1960.

'Tzaneen' (BM. 1958), R; A-629, D-5B; U-4fld; 16″ h; fls. 7½″ diam; mandarin red (HCC-17), white on midribs. PL. 17:52. 1961.

—U—

'United Nations' (Lud. 1963), R; A-759, D-5B; U-4fld; 28″ h; fls. 9″ diam; vermilion stripes on pure white petals.

—V—

'Vandyke', R; A-383. Chitt. 1933. I.—Veit. 1891. Hb. 1:51. 1934.

'Venus', NR. Hb. 1:63. 1934.

'Verona' (VM. 1961), R; A-752, D-5A; U-2fld; 12″ h; fls. 6½″ diam; carmine red (HCC-21/1), light green throat, white midribs halfway up segs.

'Vesta', NR. Hb. 1:63. 1934.

'Violetta' (W-WS), R; A-515; U-4fld; 22″ h; fls. 8″ diam; medium to dark rose, light rose throat and midribs. PL. 15:45. 1959.

'Virginia' (Heat. 1934), NR; Hb. 2:90. 1935.

'Virgin Queen', NR. Hb. 1:63. 1934.

'Viscountess Hambledon', R; A-384. Chitt. 1933. I.—Smith, 1896. Hb. 1:51. 1934.

'Vittata Harrisoniana', NR. Chitt. 1933. I.—Bull, 1894. Hb. 1:51. 1934.

'Volendam' (VM. 1956), R; A-533; 22″ h; fls. 7″ diam; white, edged rose pink. PL. 15:47. 1959.

'Voodoo' (Lud. 1960), R; A-561, D-8; U-4-6fld; 16″ h; fls. 3″-3½″ diam; scarlet, star shape white striped, light green throat. PL. 17:54. 1961.

'Vulcan', R; A-385. Chitt. 1933. I.—Holf. 1907. Hb. 1:51. 1934.

—W—

'War' (Chandler), NR. SPN. 13. 1942.

'War' (Heat. 1934), NR; U-2-3fld; fls. 6″ diam; dark red, heavily veined. 1. hom: "Mephisto". Hb. 2:90. 1935.

'Watermelon' (Zeiner, 1945), NR; D-5A; fls. 9″ diam; rose-red self. Hb. 12:104. 1945.

'White Abundance' (VW), R; A-397; U-4fld; 26″ h; fls. 8″ diam; pure white, throat slightly greenish turning to pure white. PL. 15:46. 1959.

'White Beauty' (Heat. 1935), NR. SPN. 13. 1942.

'White Belle' (BM. 1954), R; A-630, D-5B; U-3-4fld; 16″ h; fls. 7½″ diam; creamy white, broken lines and pinpricks of currant red on upper segs. PL. 17:52. 1961.

'White Christmas' (VM. 1956), R; A-534; 24″ h; fls. 8″ diam; completely pure white. PL. 15:47. 1959.

'White Crane,' R; A-681, D-5B; U-4fld; 20″ h; fls. 7″-9″ diam; pure white, light green throat. I.—Goed. 1961. PL. 18:43. 1962.

'White Favorite' (Lud. 1960), R; A-558, D-5A; U-4fld; 26″ h; fls. 8″ diam; pure white, greenish throat. PL. 17:53. 1961.

'White Giant' (Lud.), R; A-460, D-5A; U-3-4fld; 24″ h; fls. 9″ diam; white, of heavy substance, greenish throat; spr; dec. c. Lud. & Co. 1954.

'White Orchid' (Brn. 1934), R; A-386; fls. 8½″ diam; pure white, whitish green throat. Hb. 10:94. 1943.

'White Star' (Zeiner), NR; rose white stripe. Hb. 11:256. 1944.

'Willem Coetzer' (BM. 1960), R; A-651, D-5B; U-2fld; 12″ h; fls. 9″ diam; chartreuse green flushed brick red. PL. 17:52. 1961.

'Will Rogers' (Traub, 1934), NR; Hb. 2:92. 1935.

'Wings of Snow' (Camm.), NR. PL. 10:79. 1954.

'Winks' (BM. 1957), R; A-631, D-5B; U-3fld; 14″ h; fls. 7½″ diam; begonia (HCC-619), vermilion and white. PL. 17:52. 1961.

'Winner' (Beck. 1960), R; A-667, D-5A; U-4fld; 20″ h; fls. 7″ diam; orient red (HCC-819), greenish mid-stripe. PL. 18:42. 1962.

'Winter Carnival' (Lud. 1962), R; A-707, D-5A; U-4fld; 27″ h; fls. 9″-10″ diam; pure white with slight greenish-yellow throat. PL. 19:65. 1963.

'Winter Joy' (Lud. 1956), R; A-461; U-4fld; 23″ h; fls. 8″-9″ diam; vermilion red with dark red throat. PL. 14:55. 1958.

'Wisley' (BM. 1958), R; A-632, D-5B; U-4fld; 16″ h; fls. 9″ diam; azalea pink with poppy red and white on midribs. PL. 17:52. 1961.

'W. N. Campbell' (Rice, 1943), R; A-387; red and white striped. Hb. 10:149. 1943.

'Wyndham Hayward' (Traub, 1934), NR. Hb. 2:92. 1935.

'Wyndham Hayward' (Lud. 1953), R; A-462, D-5A; U-4fld; 30″ h; fls. 9″ diam; dark oriental red (HCC-819) with dark blood red throat. PL. 14:55. 1958.

—XYZ—

'Zanzibar' (HDL. 1963), R; A-763, D-5A; U-4-5fld; 18″ h; fls. 6″ diam; delft rose (HCC-o20), greenish-white midrib halfway up segs. I.—VZ. 1963.

'Zebediela' (BM. 1962), NR; bright signal red.

'Zenith' (VM. 1956), R; A-535; 24″ h; fls. 8″ diam; 3 upper segs rose on white, 3 lower segs white. PL. 15:47. 1959.

'Zephyr', R; A-388. Chitt. 1933. I.—Veit. 1900. Hb. 1:51. 1934.

'Zulu' (Rice, 1943), R; A-389, nearly black. Hb. 10:149. 1943.

'Zulu' (HDL. 1963), R; A-764, D-5B; U-4fld; 14″ h; fls. 7½″-8″ diam; mandarin red (HCC-17), darkens slightly in throat, heavily veined. I.—VZ. 1963.